June 20 Cents

GENERAL LIBRARY
MAY 10 1919
UNIV. OF MICH.

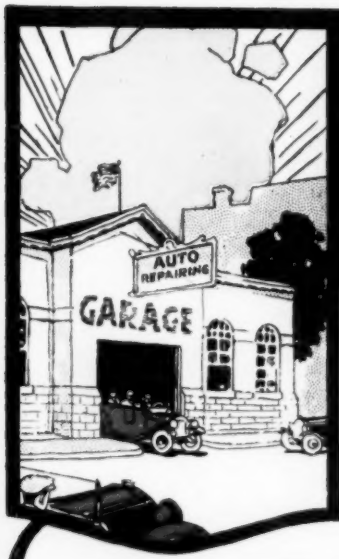
POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

REG. U.S. PAT. OFF.

Airplane Collides with Locomotive

See Page 814



Learn Auto *and* Tractor Business

Big Money in the Automobile, Truck and Tractor business. Thousands of towns and rural communities—many of them on National Highways, are without garages or repair shops of any kind.

Start a Repair Shop With proper training, a small investment will put you into one of the best paying businesses in any community—big increase in manufacture and use of Automobiles, Trucks and Tractors—establishment of Intercommunity truck and motor mail routes—has caused an enormous demand for capable mechanics and repair men.

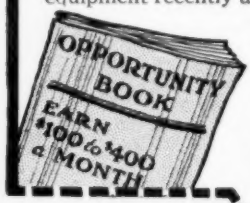
Rahe Auto AND Tractor School

GREATEST IN THE WORLD

Complete equipment—up-to-date Autos, Trucks, Tractors, Block-mounted Motors, Electric Apparatus and every other equipment necessary to train you in all branches of the business. Acres of floor space in modern, fire proof building. Plenty of room with proper ventilation, flood daylight on all floors. Every convenience and facility for thorough work and quick learning.

LEARN IN 6 TO 8 WEEKS EARN $100 TO $400 A MONTH

Every man 16 years of age or over, who will apply himself, can learn here by the RAHE PRACTICAL METHOD. Daily work with immense additional equipment recently acquired from former Military Division of the Rahe School, under supervision of numerous MASTER MECHANIC Instructors. Same practical method as used to train Soldier Mechanics in 60 days' time during war emergency. Only additional cost to take your training at "World's Greatest" Auto and Tractor School, is difference in carfare. No books used. No tools or "extras" to buy. **Plenty of opportunity to earn living expenses while here.**



Special Tuition Rate Now! To meet the increasing demand for **Rahe-trained Men** we are making a special offer to those who come within the next few weeks. This special rate entitles you to Life Scholarship in our complete courses.

Send in the attached coupon at once.

MAIL THIS COUPON for 7-day Trial Offer, wonderful story of opportunities and big 68-page illustrated catalog FREE

Mail This Coupon Today!

Rahe's Auto & Tractor School
"GREATEST IN THE WORLD"
2893 Oak Street
Kansas City, Mo.

Name .....

Address .....

Age *Occupation* .....

Popular Mechanics Magazine

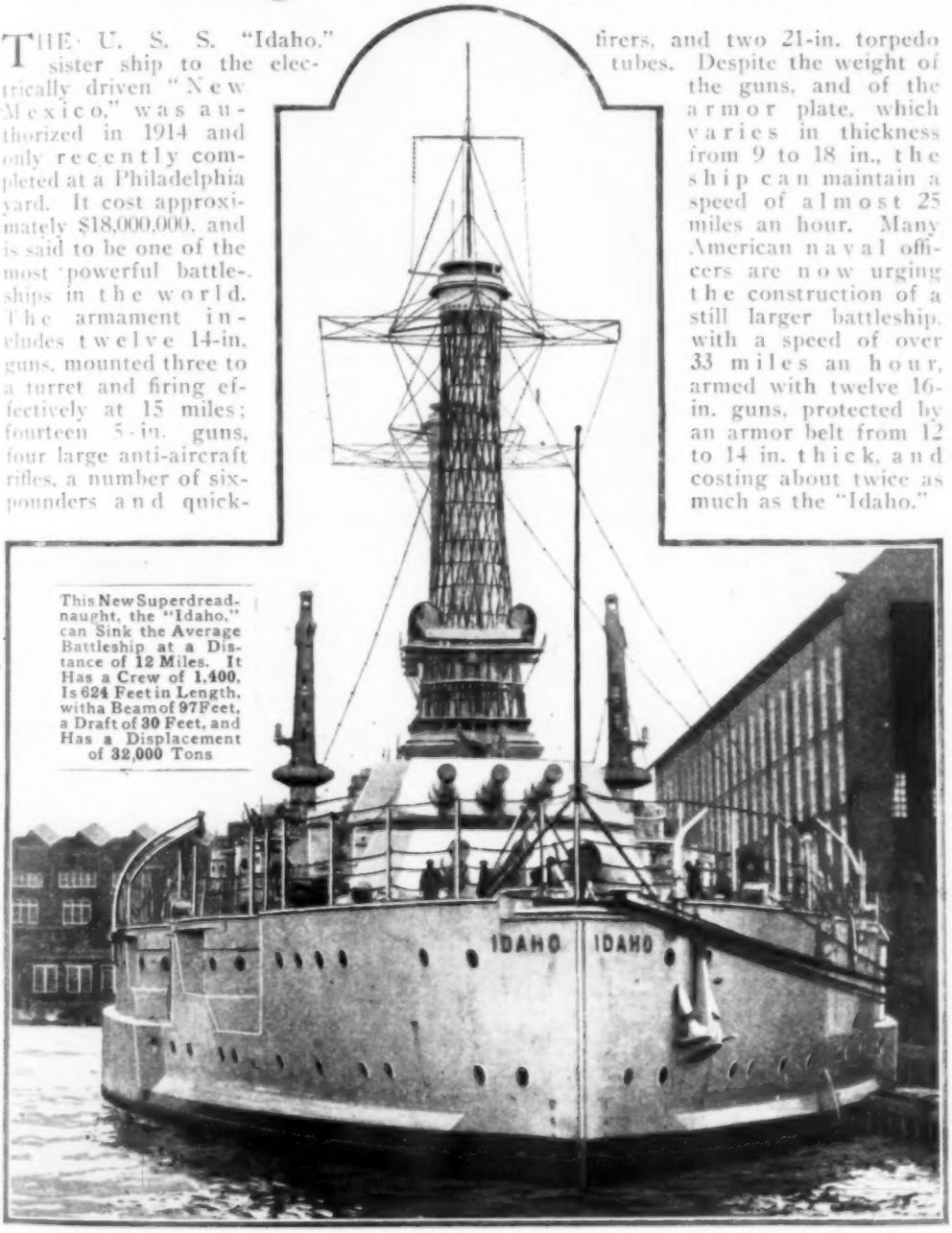
REGISTERED IN U. S. PATENT OFFICE

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 31 JUNE, 1919 No. 6

Dreadnaught "Idaho" Added to Fleet

THE U. S. S. "Idaho," sister ship to the electrically driven "New Mexico," was authorized in 1914 and only recently completed at a Philadelphia yard. It cost approximately $18,000,000, and is said to be one of the most powerful battleships in the world. The armament includes twelve 14-in. guns, mounted three to a turret and firing effectively at 15 miles; fourteen 5-in. guns, four large anti-aircraft rifles, a number of six-pounders and quick-firers, and two 21-in. torpedo tubes. Despite the weight of the guns, and of the armor plate, which varies in thickness from 9 to 18 in., the ship can maintain a speed of almost 25 miles an hour. Many American naval officers are now urging the construction of a still larger battleship, with a speed of over 33 miles an hour, armed with twelve 16-in. guns, protected by an armor belt from 12 to 14 in. thick, and costing about twice as much as the "Idaho."



This New Superdreadnaught, the "Idaho," can Sink the Average Battleship at a Distance of 12 Miles. It Has a Crew of 1,400, Is 624 Feet in Length, with a Beam of 97 Feet, a Draft of 30 Feet, and Has a Displacement of 32,000 Tons

GIRL IN TERRIBLE ADVENTURE FALLS FROM HIGH TOWER

Some adventures, however blood-curdling, leave a not unpleasant reminiscence

Nurse's Narrow Escape from a Terrible Death is Indicated by Lines Showing the Course of Her Fall from One Balcony to Another, 300 Feet above the Ground

as a solace. Not of that quality was an accident that befell a hospital nurse at Denver, Col. To while away some spare moments, one recent Saturday morning, she visited the 20th-story balcony of a big department-store building. Her pleasure in the view of distant mountain peaks was changed to misgiving as her gloves—new gloves—slipped suddenly over the balcony wall and disappeared. Curious as to their flight, she leaned out to locate them; leaned just a little too far. As she looked down through what seemed, an immensity of space, that strange vertigo of high places seized her. She realized, in helpless terror, that her body was slipping outward over the low wall. Then, in an instant she was whirling downward to seemingly inevitable death.

Thirty feet below, another little balcony projected. Its narrow wall caught her as she fell; her body swayed hesitatingly, and slipped, by the merest chance, inward. Below her yawned 300 ft. of sheer drop. By a trick of gravity she was saved! Saved; but not yet rescued. It was 11 o'clock. All Saturday, night, and Sunday, and night again, she dragged herself, bruised and considerably injured, along that narrow way and beat feebly upon a locked door. Cold rain beat upon the concrete; hunger, thirst, and pain assailed her with bitter and hopeless force.

It was nine o'clock Monday morning, 46 hours later, when an electrician upon his rounds heard a faint tapping from an unused room. She was still conscious when he found the key and looked out upon the balcony. Her terrible experience will keep her away from the high places for the rest of her days. If any good can come of such a mischance, perhaps it is not too much to hope that it will influence a movement to see that such high places are not left unguarded.

MARKINGS ON STOLEN CARS IN BULLETIN TO DEALERS

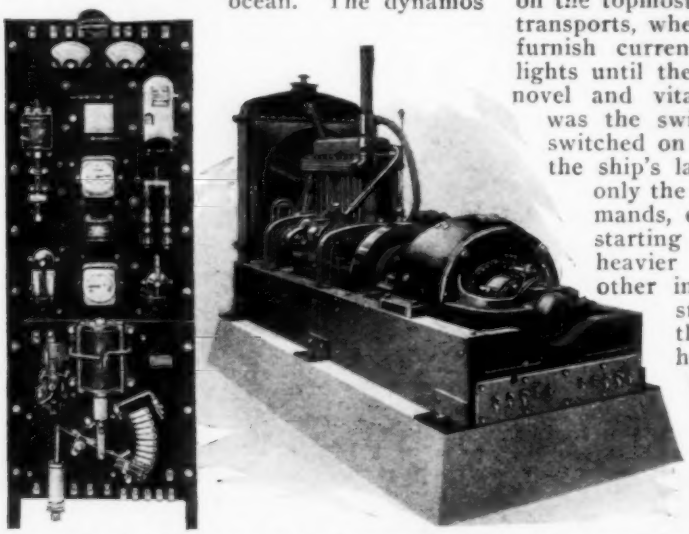
A service of genuine worth is rendered to its patrons by one automobile-manufacturing company. When it is reported to the central factory that a car has been lost or stolen, the factory history is consulted and the car's secret markings collected. In bulletin form these markings are then sent regularly to the company's dealers and garage men, who know that a thief always erases the engine mark but usually overlooks the number on some small, inconspicuous part. In this way the company has been able to recover hundreds of stolen cars in the last few years.

RESCUE CAGE ON TRUCK IS LATEST FIRE ESCAPE

WHEN the latest form of fire truck draws up before a tall building, and the giant ladder gropes its way upward through the smoke and flame, it carries with it a wire cable attached to a cage of steel. As the upper end of the ladder comes firmly to rest against an upper-story wall, the steel cage, like an elevator without a shaft, depends from its pulley at the top within easy reach of the windows. Gently but rapidly lowered by firemen turning the cable drum on the truck below, the cage brings down in safety and comfort four persons at a trip. Thus vanishes the romantic but hazardous ride of the heroine on the brave fireman's shoulder.

EMERGENCY GENERATING PLANT ON TRANSPORT'S TOP DECK

Nothing more disheartening is known to warfare than the unexpected explosion of an enemy torpedo near the boiler room of a solitary, troop-laden transport in mid-ocean. The dynamos are quickly flooded, perhaps even before the precious wireless signals are sent; at night the ship sinks in darkness with decks and corridors the scene of helpless confusion. To avoid any such disaster on American ships, special gasoline-driven generating and storage sets were installed on the topmost decks of many American transports, where they could continue to furnish current for wireless and deck lights until the ship actually sank. The novel and vital feature of the plants was the switchboard which instantly switched on the small generator when the ship's large dynamo failed, using only the storage cells for small demands, of 25 amperes or less, but starting the generator itself for heavier loads. The board does other interesting things, too: It starts the generator when the batteries approach exhaustion; it displays a red light when the motor refuses to start after three minutes' cranking, and it even tests the plant with a 20-minute run once every 24 hours. The plant may also be started by various push buttons, one being in the wireless room.



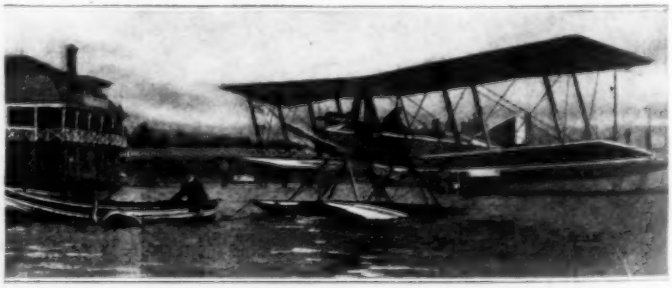
The Automatic Switchboard on the Left was Designed to Give Unfailing Control of the Auxiliary Generating Plant on the Transport's Top Deck. Its Chief Function Was to Throw In the Auxiliary Line When the Potential Dropped in the Ship's Mains

AMERICAN ENGINEER INVENTED ANESTHETIC EUROPE USED

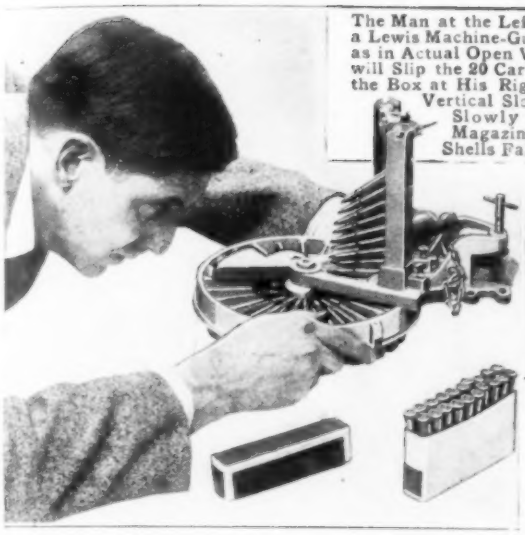
Nikalgin, the external anesthetic used so successfully in army hospitals on the Verdun and Somme fronts, and at Paris, is the invention of an American electrical engineer. The Greek components of the word mean "victory over pain." The American also designed a jet for applying the solution with sufficient force to penetrate gauze dressings and pus-coated surfaces. The preparation is reported to be composed of quinine, hydrochloric acid, and urea, but the manner of compounding it is not disclosed. The dispensing of large quantities to the French and Italian armies by the Red Cross has prompted a request for a senate investigation of America's failure to adopt it for war work.

INTERNATIONAL AERIAL MAIL MAKES FIRST DELIVERY

It was the Canadian-United States boundary, of course, that was crossed in the first international transfer of mail, which was accomplished March 3, 1919. The flight, which was from Vancouver, B. C., to Seattle, Wash., was made by W. E. Boeing, of Seattle. The distance is approximately 125 miles.

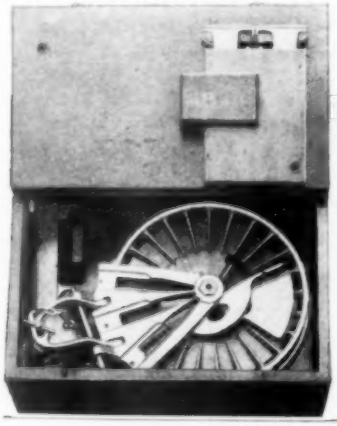


International Mail Airplane About to Leave the Harbor of Vancouver, British Columbia, for the Flight to Seattle, Washington, the First International Aerial Mail Route



The Man at the Left is Loading a Lewis Machine-Gun Magazine as in Actual Open Warfare. He will Slip the 20 Cartridges from the Box at His Right into the Vertical Slot; Then He Slowly Spins the Magazine, and the Shells Fall into Place

Above, He is Filling the Magazine with Ammunition, Held Five in a Clip. A Pull on the Triggers will Eject the Clip Which is Ordinarily Removed by a Tiresome Wrenching Motion



At the Right, the Loading Machine is Shown in Good Detail. Cartridges are being Inserted into Radial Chambers by Hand, However, as Is Often Necessary in Aerial Gunnery Where Common, Tracer, and Incendiary Shells are Sometimes Loaded in Rotation, and Only after a Careful, Individual Inspection. At the Left, the Apparatus is Shown Disassembled, and Packed for Transportation in Its Wooden Case

LOADING DEVICE FOR LEWIS GUNS ADAPTED TO ALL EMERGENCIES

One of the war secrets that it is now permissible to disclose has to do with an invention adopted by the War Department in the latter months of the conflict, which tremendously multiplied the effectiveness of the famous Lewis machine gun by enabling one man to attend to the loading of a score or more of these deadly weapons, so that those assigned to these pieces could deliver practically an uninterrupted fire. The ammunition for the Lewis gun is contained in a detachable circular magazine holding either 47 or 97 shells. This holder is called a pan, and the new invention consists of a device, to the underside of which the pan is temporarily attached for filling with shells. The loader is so designed that it can be mounted on the edge of a box, held in the lap, or used while one lies prone on the ground out of view of the enemy.

In action, the ammunition for the Lewis gun is usually taken from clips holding five shells each, or from boxes containing 20 shells each, or it may sometimes be necessary to load the gun by hand where tracer or other special shells are to be used. This rapidly operating loading device is suited equally well to all these varying conditions—a fact which accounts for the large orders for the device placed by the War Department.

When the boxes of cartridges are to be emptied a box is held in a vertical position, and with two downward strokes of

the hand the shells are transferred to the vertical grooves, or holder, extending upward from the revolving loading wheel above the pan. When emergency, or other circumstances, makes it necessary to take shells from filled "clips," the latter are dropped into the vertical grooves and, by operating a pair of triggers with the thumb and finger, the clip is ejected. A turn of the wheel causes the shells to drop into the 20-odd chambers radiating from its center, and as the wheel revolves, they are fed into the pan temporarily attached beneath.

If, in a gas attack, it is necessary quickly to empty loaded pans so that the gas will not cause a sticky corrosion on the surface of the shells—as experience showed it would do when in contact with the ammunition—the machine can be reversed and the shells quickly removed from the holders or pans.

A further advantage of this adaptable machine is that it can be disassembled and packed into very small space, and carried either in a small wooden case or in a light canvas bag hung over the shoulder.

BRONZE RANGER AND HORSE GUARD TEXAS PRAIRIES

Near the spot where a young Texas ranger, Charles H. Noyes, met with a fatal accident three years ago, his life-size figure in bronze, leaning on a big bronze horse, is now being erected. The youth, only 21 years old, was 6 ft. 4 in. tall, and his statue, worked with exquisite care by a celebrated sculptor, immortalizes the stalwart virility of the western plains. In the eyes of the grieving father who conceived it, the bronze is a memorial to an only son, but to those keenly alive to the glories of the West, it is a perpetuation of vanishing romance. The statue rests upon a pedestal of granite mined from quarries near the Texan's own home, on a knoll overlooking a beautiful valley.

Life-Size Bronze Statue, Executed in the Benvenuto Cellini Process by Pompeo Coppini, as a Memorial to a Young Texas Ranchman: It will Stand Guard over the Prairies of His Home State

¶ A shopper may see her pastry pulled out of the oven in a large electric bakery recently installed in a metropolitan department store.

RECORD OF EACH AUTOMOBILE TO FOIL SKILLED THIEVES

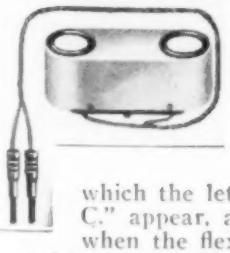
Automobile stealing is becoming a highly developed art, and such a growing one that insurance companies have united with the great manufacturing interests to stamp out the evil. Just as they classify the offenders as the amateur who steals to joy-ride, and the professional who steals to sell, so the remedies they suggest may be divided into two classes. To foil the impetuous, usually befuddled joy-rider only a good lock is needed. Any standard make with the approval of the insurance companies will do. But to thwart the skilled auto thief locks are not enough; he is quite prepared to tow the car away, locks and all. The remedy that is really needed, they say, is national legislation that will remove the thief's incentive, that will make it impossible for him to sell the car. They would have the car accompanied by a title or deed at every change of hands, like real estate, or other property.

BUY WOOD FUEL BY WEIGHT, NOT BY BULK, SUGGESTED

The popular household fallacy that hard wood has greater fuel value than soft is condemned in a government forestry bulletin as true in only a limited sense. Thus, one cubic foot of hard wood will probably yield more heat than one cubic foot of soft; but, comparing equal weights, it is found that their heat values are practically the same. It is therefore advised that future purchases of wood for household use be made by weight, so that the heating value secured may more nearly correspond to the money expended. Another objection to the present system of buying by volume is that, with varying shapes and sizes, the purchaser never really knows how much he is getting. The suggestion is also made that the present coal shortage could be greatly relieved by burning wood and brush secured from judicious thinning of the forests surrounding many rural communities.

POCKET ELECTRICAL DEVICE TELLS KIND OF CURRENT

Electric current is available to most people, but it is not always apparent whether it is direct or alternating, 110 or 220 volts. A new pocket instrument, 4 in. long, 2 in. high, and 1½ in. wide, has a dial at each end in which the letters "A. C." or "D. C." appear, as the case may be, when the flexible cords are connected to the circuit. The voltage is indicated in the same manner. Provision is made for connecting to any kind of terminal, a plug being provided into which the posts on the wire-ends fit, for lamp-socket testing.



RADIOTELEPHONE STATION IN A HANDBAG

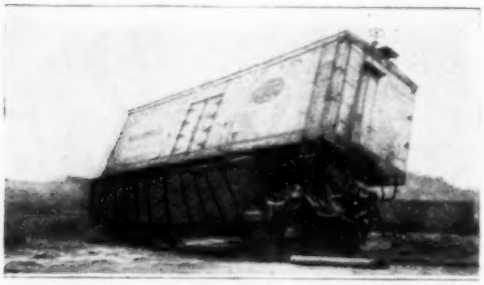
Pocket wireless, that elusive objective of science, is only a step away; for the handbag radiotelephone has arrived. A 12-lb. bundle of apparatus, something like an umbrella, for example; an antenna, and a head telephone, constitutes the full equipment of a personal wireless station successfully demonstrated by a Philadelphia inventor. With his rifle for the antenna, a soldier executed commands uttered over 200 yd. away by the inventor, whose wave-sending aerials consisted of three lengths of stovepipe mounted on a board. Three men in a moving auto listened while the fourth held converse with his wife in a garage 500 yd. back, the car body serving as the wave collector. The exact nature of the apparatus is not yet divulged; but that no part of it is really new has been disclosed. The current consumed is exceedingly small, and the estimated cost is so moderate that before long, perhaps, these traveling radio sets will be a common sight.

The Soldier at the Left, with the Cords of His Head Telephone Clipped to His Rifle, can Hear at 200 Yards' Distance the Orders of the Man at the Right, Whose Antenna Consists of Three Lengths of Stovepipe. All the Rest of His Wireless Equipment Is in the Little Box at His Side

¶Twenty million tons of paper pulp can be produced annually from India's bamboo and grasses, declares a recent estimate.

DERAILED FREIGHT CAR LANDS ON TOP OF LOADED GONDOLA

When a dragging brake beam derailed a freight train at Hamilton, Ontario, recently, a heavy refrigerator car concluded



The Refrigerator Car was Thrown, Trucks and All, on Top of the Gondola Car by a Dragging Brake Beam, and the Gondola, with Its Strange Load, was Hauled Away on Its Own Wheels

the performance by climbing, trucks and all, on top of a gondola car loaded with steel plates. The wrecking crew, hurrying to the rescue, forgot to lower their crane and it knocked a highway bridge out of shape. The gondola car, with its extraordinary load, was finally hauled away on its own wheels.

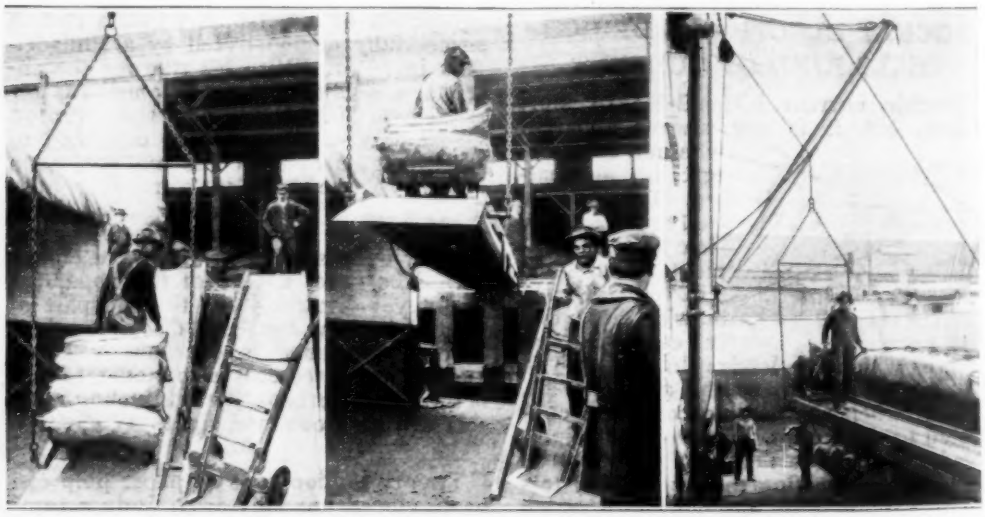
¶ The Atlantic Ocean recently swallowed up 200,000 gas shells and many large drums of poison gas that were intended for German consumption. The gases were commercially valueless, and it was feared that the containers would be eaten through.

WOOD-STAVE PIPE LINE PUT TO UNUSUAL TEST

Several times during the same season heavy floods lifted a large wooden pipe line, supplying a hydroelectric power station, clear of its supports and battered it against its ballast bed. Yet examination at the end of the season showed that the pipe was perfectly sound and had retained its circular shape throughout. This is noteworthy, as the pipe was almost four feet in bore, was strengthened only by hoops, and was anchored only at the intake. It seems to indicate, too, that wood-stave pipe is a great deal stronger than is generally supposed, and is well fitted for use in hydroelectric plants.

STEAM WINCH MAKES WORK OF STEVEDORES EASY

It usually requires the hardest efforts of two stevedores to push a heavily loaded hand truck from the deck of a small river boat, up a steep gangplank, to the dock. But by hitching a steam winch to the lower end of the incline, and thus lifting stevedore and load a foot above the level of the dock, the work is made so easy that unloading time is cut in half. It will be observed that the steel apron which enables the truck to roll upon the incline also prevents it from rolling back during the ascent. Naturally, the incline is lowered for the next man the instant the stevedore touches the dock.



The Stevedore at the Left has Run His Heavy Load of Potatoes upon the Incline. In the Next Two Pictures He has been Lifted by the Steam Winch to a Position One Foot above the Level of the Dock. With This Arrangement Unloading Time is Cut in Half and the Stevedores Satisfied Entirely

HIGH-ALTITUDE PLANE, FLYING WEST, CARRIED 200 MILES EAST

THAT miles above the earth's surface an air current of high velocity flows eastward with the rotation of our globe has long been known to scientists. A sounding kite has ascended to a height of 23,000 feet and a pilot balloon has reached an altitude of 126,800 feet, or more than 24 miles. A noted meteorologist, Prof. McAdie, Harvard University, estimates this great air current to extend from a height of about 13,000 to over 50,000 feet. Above this is a westward-moving air stratum and still higher another eastward-moving stratum. However, though so much was established, it remained for Maj. R. W. Schroeder in his record-breaking altitude climb of a few months ago to demonstrate, unwittingly, the practical possibilities of the first air stream in its relation to aeronautics and to give substance to the wistful dreams of some of the world's master birdmen. Major Schroeder ascended from Dayton, Ohio, and flying constantly in a westerly direction climbed to an altitude of 28,900 feet—approximately five and one-half miles. Then, being out of gasoline, he descended to find himself neither *near* nor *west* of his starting point as he had expected, but nearly 200 miles *east* of it, near Canton, Ohio. This meant that with his plane traveling *west* at 100 miles an hour the great *eastward* moving air current must have had a velocity of more than 300 miles an hour in order to carry him with it 200 miles. Probably as graphic an illustration as any of what happened to him is afforded by a passenger running through a rapidly moving train. The traveler may go toward the rear at a rate of five miles an hour but nevertheless he is being carried in the opposite direction ten times as fast or 50 miles an hour. Major Schroeder's experiences and sensations on this flight are simply and vividly told by himself.—Editor.

BY MAJOR R. W. SCHROEDER, *A. S. A.*

I HAVE been connected with aviation since 1910, and during this time I have worked as a mechanic for some of America's leading pilots and gained a very valuable training. I was always keen to learn all I could, and I dare say, that all my past experiences were beneficial to me in my efforts to establish a new world's altitude record. The last world's altitude record held by America was made in August, 1911, when the late Lincoln Beachey made a climb to 11,642 ft. at the big aviation meet in Chicago. Since that time G. Legagneux, in France, made a climb to 20,258 ft. on Dec. 28, 1913.

It is to be understood that, for military reasons, I am unable to give a more complete description of the improvements and changes which I made in the motor. I am proud to say, however, that the motor was a Hispano-Suiza, American-built, as well as the carburetor and magnetos, and that the discoveries which were made in these experimental climbs are for the use of the United States government.

In order to take an airplane to a higher altitude than any other pilot in the world, I found that more than one or two attempts would be necessary. I made three, the first taking me to an altitude of 24,000 ft., the second to 27,000 ft., and the last to 28,900 ft., all of which would have been world's records, and now I feel certain that with a few changes and improvements, I can get to 30,000 feet.

Becomes Accustomed to Rare Air

Most people cannot stand high altitudes, and from 10,000 ft. to 15,000 ft. bleed at the nose and ears. I had been to 12,000 ft. at different times and experienced no difficulties. After being put in charge of the testing squadron at Wilbur Wright Field, at Dayton, Ohio, my duties required me to go to the "ceiling" with all new types of high-powered battle airplanes which were being experimented with by the government. (By "ceiling" is meant the highest altitude the airplane can reach, and at this height it will hang in the air by the propeller.)

During these trips I would quite often go without the use of oxygen, and in time I discovered that I was becoming accustomed to the rare, thin air. However, I did not seem to be able to go above 23,000 ft. at any time without experiencing a sort of sleepy, tired, cross, and hungry feeling, which I was able to overcome only by the use of oxygen. Without the use of oxygen at such altitudes, I would have the impression that I was doing everything just right; and even if the airplane would get into some critical position, and, when I looked down, the earth, which should be underneath me, apparently was not there any more, but way over to the other side of the machine, I believed that I was flying all right and that the earth was in the wrong place. After having these experiences, I decided that I would have to overcome the dangers possibly consequent upon them, and the way I did it was to keep my mind on one thing, and that was, to use oxygen when the earth appeared to be in the wrong place. This precaution worked out very well.

Equipment for High Altitudes

The cold, thin air is one's greatest adversary. First of all, one must make a study of the performance of his motor at these high altitudes. This I did, and made the necessary changes each time before trying again. A very positive oxygen regulator and face mask should be used. These were unobtainable, however, for the sets I had previously tried out had failed to function above 21,000 ft. Furthermore, the face mask pressed so tightly against my face, that it interfered with the flow of blood, and my face grew numb. So I used a rubber hose directly connected from the oxygen bottle, regulating the flow with a valve. The hose I placed in my mouth so that I would breathe air and oxygen at the same time. I also pressed my tongue against the end of the hose in order to tell if the oxygen was still flowing. This method worked very satisfactorily, except that the oxygen bottle and the rubber hose gathered about a quarter of an inch of frost, which made it very unpleasant.

Oxygen Changes Night to Day

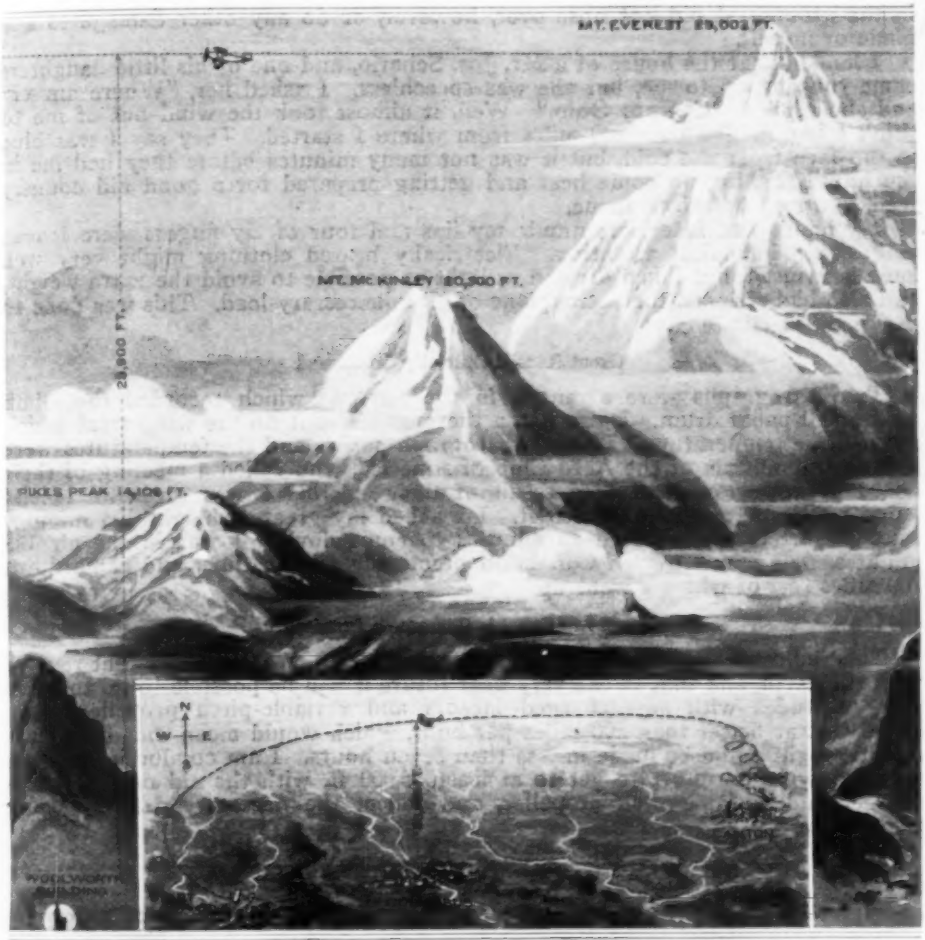
The following experiences and sensations which I noticed during my flight were due to lack of oxygen. I took off at 1:45 p. m., Sept. 18, 1918, and made a steady westerly climb, passing through clouds at 8,000, 12,000, and 16,000 ft. At 20,000 ft., while still climbing in large circles, my goggles became frosted, making it very difficult to watch the instruments. The temperature at this altitude was 18° centigrade below zero. When I reached 25,000 ft., I noticed the sun growing very dim. I could hardly hear my motor run, and I felt very hungry. The trend of my thought was, that it must be getting late, that evening must be coming on, and that this was the reason the sun was getting so dim. But I was still climbing, so thought I might as well stick to it a little longer, for I knew I could reach my ceiling pretty soon. Then I would go down, and even though it were dark, I could land all right, for I had made night landings many times before; and so I went on talking to myself, and this I thought was a good sign to begin taking oxygen, and I did. I was then over 25,000 ft. up and the temperature was 25° centigrade below zero.

As soon as I started to inhale the oxygen, the sun grew bright again and my motor began to exhaust so loudly that it seemed something must be wrong with it. I was no longer hungry, and the day seemed to be a most beautiful one. I felt like singing with sheer joy as I gazed about through the small portion of my goggles which had no frost, due to a drop of oil which had splashed on them from the motor.

It was wonderful to see the very clear blue sky with the clouds thousands of feet below. The frost on my goggles bothered me very much, however. At times I had to remove one glove in order to put the warm palm of my hand on the glass to thaw the frost. I did this every few minutes so that I could take the proper readings of the instruments, which I marked down on my data pad. I believe that if my goggles had been better ventilated, they would not have frosted. When I was at about 27,000 ft., I had to remove the goggles, as I was unable to keep a steady climb. My hands by this time were numb and worried me considerably. The cold, raw air made my eyes water, and I was compelled to fly with my head well down inside the cockpit. I kept at it until my oxygen gave out, and at that point I noticed my aneroid indicated very nearly 29,000 ft. The thermometer showed 32° centigrade below zero. The lack of oxygen was affecting me and I was beginning to get cross. I could not understand why I was only 29,000 ft. after climbing for so long a time. I remember that the horizon seemed to be very much out of place, but I felt that I was flying correctly, and that I was right and the horizon wrong.

Descends to Find Himself Lost

About this time the motor quit. I was out of gasoline, the propeller stopped, and everything was quiet; so, down I went in a spiral. When I had descended to about 20,000 ft., I began to feel much better, and realized that the lack of oxygen had affected me. I passed down through the clouds at 16,000 ft. and as I remember, it was snowing from these clouds upon the next layer, some 4,000



Ascending Westerly, in His Record-Breaking Altitude Flight, Major Schroeder was Carried Eastward Nearly 200 Miles by the Strong Wind Strata Five and One-Half Miles above the Earth and Following Its Rotation. His Flight, as Shown in the Small Diagram, Began at Dayton, and Ended at Canton, Ohio. Had He Been Able to Travel with the Wind at This Great Height, He could have Landed within 102 Feet of the Top of Mt. Everest, Having Passed 12,500 Miles, or Halfway Round the World, in About 42 Hours. Some Lofty American Eminences are Also Shown in the Larger View to Convey an Idea of What It Means to Scale the Skies

ft. below. I am not positive as to this, as I may still have been affected by the lack of oxygen. I noticed, as I descended, that the air seemed to be very thick and stuffy, but very nice and warm.

During the entire trip I did not see the ground, from the time I went up through the clouds above Dayton until I came through the clouds again, at 4,000 ft. above Canton, over 200 miles from my starting point.

I was lost, beyond a doubt, with a dead engine over very rough country. For a few minutes I was a very busy man, trying to find some kind of a field to land in, but nothing looked good to me. However, I had my pick between a half-mile race track, a hilly pasture with a lot of trees, and a graveyard. I picked the race track as the best bet, but when I got down to about a thousand feet, I could see two telephone-pole lines, stretching right across the field, so I glided back over the graveyard and to the pasture full of trees, which was my last chance. And I took it; in fact I had to. I landed all right, but broke the tip of my propeller, which was standing vertical when I rolled into a depression

in the ground. I did not nose over, however, or do any other damage to airplane or myself.

I landed near the house of a Mr. Jos. Schario, and one of his little daughters came running up to me, but she was speechless. I asked her, "Where am I?" and she replied, "Canton, Ohio." Well, it almost took the wind out of me to think I had drifted over 200 miles from where I started. They say I was blue in the face from the cold, but it was not many minutes before they had me in the house soaking up some heat and getting prepared for a good old country feed, in a real American home.

My hands and face were numb, my lips and four of my fingers were frozen and required medical attention. Electrically heated clothing might very well have been used, but I had dressed as light as possible to avoid the extra weight, and also had stripped the entire plane of all unnecessary load. This was done to assist me in climbing.

Great Record Officially Confirmed

Two barographs were arranged in the airplane which recorded the climb on a small paper drum. I also had a thermometer out on the wing strut which showed the temperature. The two barograph papers and the temperatures were sent to the officials of the Aero Club of America, who called a meeting of their board of governors, and as a result of their meeting I was given an official world's altitude record of 28,900 ft. I reached my greatest height 105 minutes after I started. It required 20 minutes to come down. I was in the air 125 minutes, flying in a *westerly* direction practically all the time, and came down 200 miles *east* of where I went up.

Travel in High Air Currents a Possibility

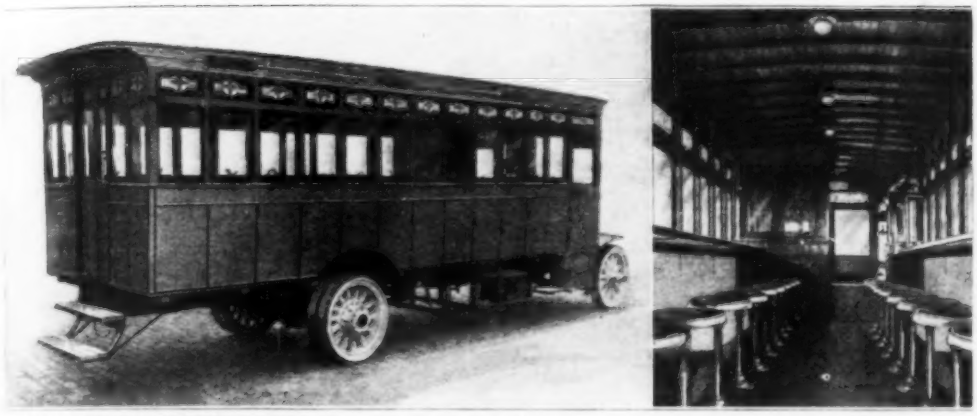
This indicates that there are very strong winds at great altitudes that revolve with the earth, and that in the very near future it will be possible to go to these great altitudes with supercharged motors and variable-pitch propellers, and travel east at better than 300 miles per hour, which would mean that the transatlantic flight could be made in less than seven hours. I am conducting experiments now in an effort to get to at least 35,000 ft. with the aid of the supercharger and variable-pitch propeller, and collect the necessary data by many trial flights.

WARNING SIGNS GUARD PUBLIC AGAINST POLLUTED WATER

Down in southern Ohio there are many happy memories of stolen swims or moonlight canoe trips on the Little Miami River. But with the war came a huge munitions plant—and busy investigators to safeguard the workers' health. The stream was investigated in its turn, and its crystal waters found to be full of germs. So unromantic warnings along its length now frighten the hot and thirsty world away from the innocent-appearing Little Miami River.

ATLANTIC CITY AIR PORT IS FIRST OF KIND IN WORLD

In the heart of Atlantic City, N. J., lies a large level field that is soon to become the first "air port" in the world. Starting from this port, air craft will be registered, and will receive their clearance papers, exactly as with ships of the sea. This feature will no doubt be most prominent in the future when regular transatlantic flight is assured. Of present importance, however, are several other purposes announced by the three aerial associations behind the scheme. The field is intended as an aerial mail and police station for Atlantic City; it will serve as an aerial garage; it will be a terminal for the coming New York-Atlantic City passenger service; and it is hoped that it will furnish other American cities with an example of a well-managed municipal aerodrome.



COPYRIGHT, UNDERWOOD & UNDERWOOD

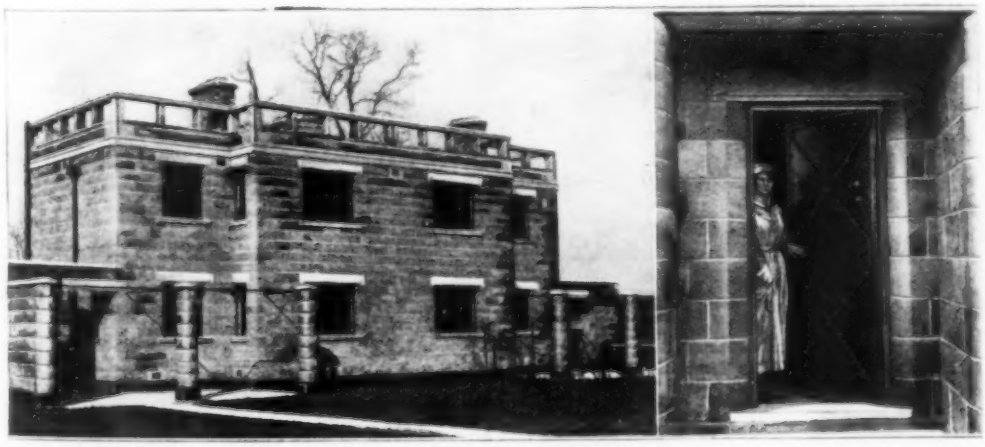
This Is the New York Police Department's Traveling-Restaurant Truck Which will Relieve the Tedium of Long Winter Patrols with Hot Coffee and Sandwiches. It will Hold Comfortably 20 Stalwart Policemen, without Crowding the Shiny Coffee Machine or the Capacious Pantry

MOTORIZED RESTAURANT PLEASES POLICE FORCE

Those who watched the home-coming parade of New York's 27th Division will recall the big motorized "red-hot" wagon which preceded the marchers, distributing sandwiches, apples, and coffee to the wounded soldiers in the stands. They probably did not know, however, that the traveling restaurant is the property of the New York Police Department, and is intended for the refreshment of "coppers" on long, tiresome beats. The body of the car is 21 ft. long and 7 ft. wide, and is mounted on a three-ton chassis. Counters and seats along the sides accommodate 20 policemen, while a coffee machine and a capacious cupboard hold the good cheer. The car is warmed in winter by radiators heated from the exhaust manifold.

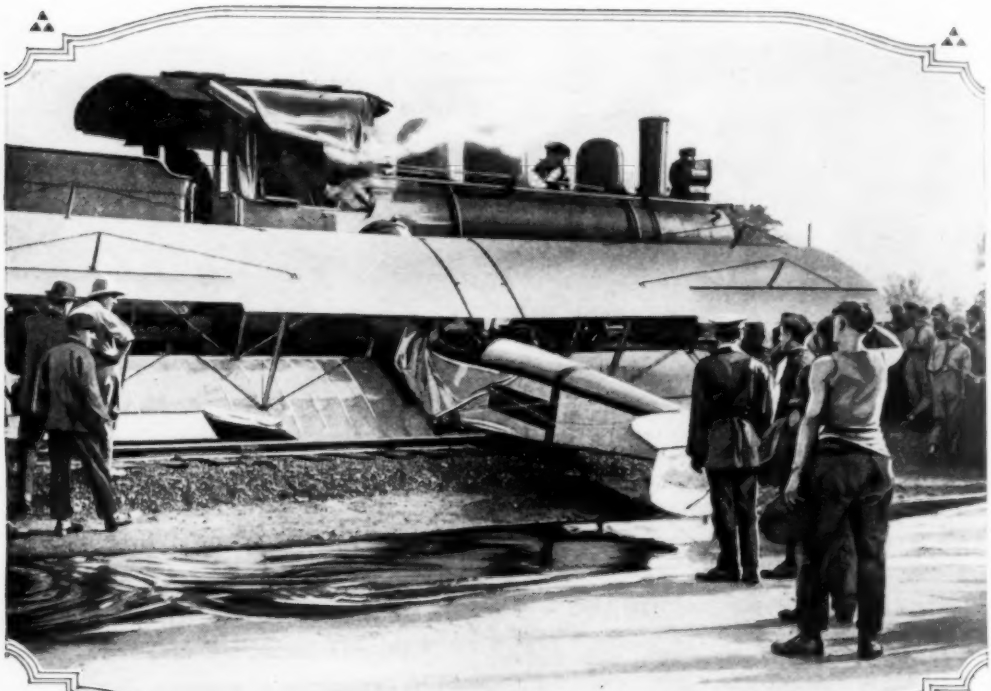
EVEN SHELVES ARE STEEL IN FIREPROOF HOUSES

Two experimental concrete houses, recently built in England, go the limit in fireproof construction. Concrete and steel are used exclusively, the floors being of jointless composition with rounded corners, while window frames, trimmings, doors, staircases, and even the cupboard shelves are of steel. The cottages are fitted with every modern improvement, and are said to have excelled similar dwellings of wood or brick, both in time and cost of construction.

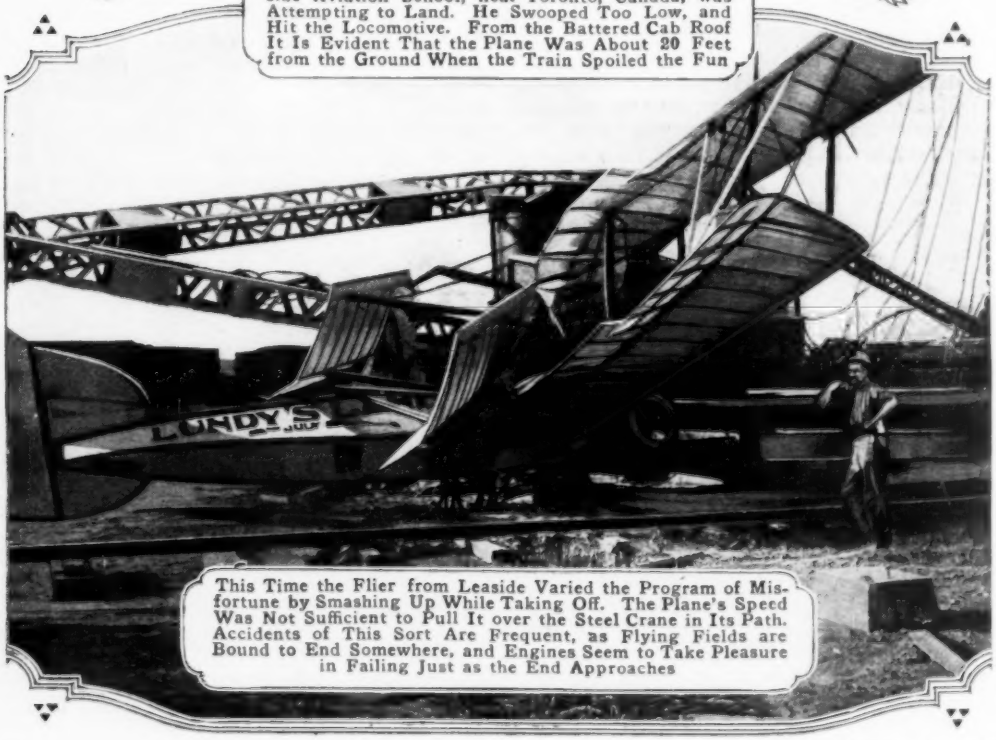


Not One Stick of Wood was Used in Building This Fireproof Residence. Its Walls, Floors, and Partitions Are Concrete, While Window Sashes, Doors, Trimmings, and Even Pantry Shelves Are Steel. At the Right is Shown a Steel Door Swung in a Frame of the Same Material

ACCIDENTS STILL ADD ZEST TO GREATEST SPORT



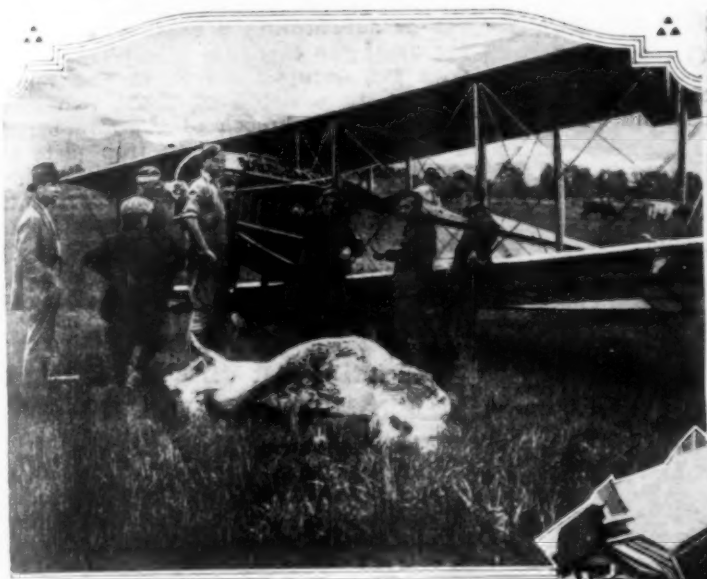
Remarkable Photograph of Airplane and Locomotive at Moment of Collision: A Cadet at the Leaside Aviation School, near Toronto, Canada, was Attempting to Land. He Swooped Too Low, and Hit the Locomotive. From the Battered Cab Roof It Is Evident That the Plane Was About 20 Feet from the Ground When the Train Spoiled the Fun



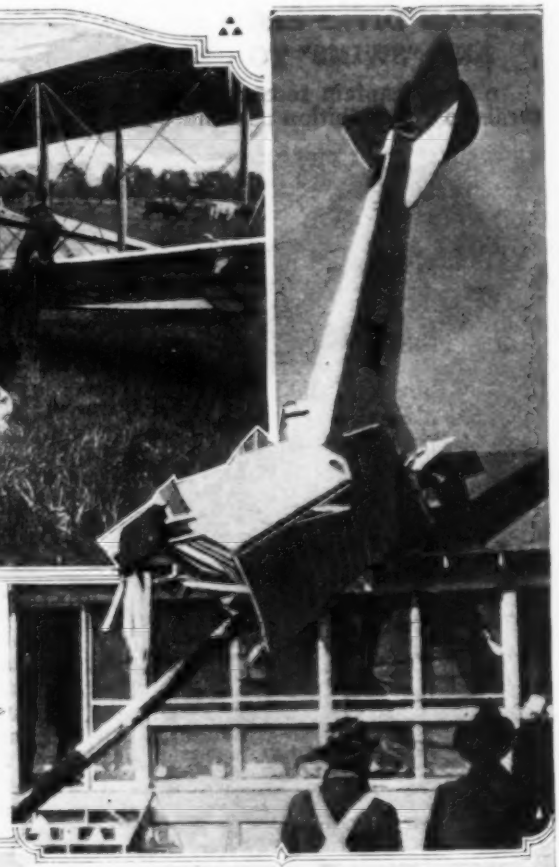
This Time the Flier from Leaside Varied the Program of Misfortune by Smashing Up While Taking Off. The Plane's Speed Was Not Sufficient to Pull It over the Steel Crane in Its Path. Accidents of This Sort Are Frequent, as Flying Fields are Bound to End Somewhere, and Engines Seem to Take Pleasure in Failing Just as the End Approaches

PHOTOS BY UNDERWOOD & UNDERWOOD

GRAVITATION CONTINUES TO BE AIRMAN'S FOE



This Airman was Forced to Land in a Pasture near Toronto, Canada; So He Turned Toreador, and Slew the Farmer's Bull. From His Gestures, It Is Possible That He is Explaining Just How the Whole Thing Was Really the Fault of the Stupid Bull



The Plane at the Right was Driven by Its Pilot Right through the Roof of a Texas Home, Wedging Itself into the Rafters So Tightly That Real Effort was Needed to Extract It before Repairing the House. A Telephone Pole Managed to Include Itself in the Mix-Up

A Queer War Story Thrilled Many Feminine Hearts Not Long Ago. It Told of a Luckless Airman Who Found He could Not Make His Plane Descend. He Drifted, the Story Went, Until Friends Rose and Rescued Him, Leaving the Airplane to Float On. Airplanes Always do Come Down, However. This Cadet Ruined the Post Commander's Auto When Landing from His First Flight

AIRMAN DIVES FROM BALLOON AND "SWIMS" TO GROUND

An army captain recently added a few thrills to an exhibition parachute drop by

Blasé Aero Fans Gasped for Breath When This Balloonist Dove Headlong from His Basket

diving, head first, from a balloon basket, 2,000 ft. in the air. When his descent became steady, he struck out with hands and feet in the old-fashioned breast stroke used in swimming, changing his course appreciably, it is said.

QUEER MOUNT FOR ARTILLERY USES VISCOSITY PRINCIPLE

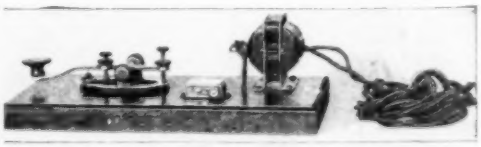
It is a peculiar property of certain viscous substances to resist instantaneous impulses, while yielding readily to gradually applied forces. A European inventor makes use of this principle in artillery construction, by the curious process of substituting a mass of pitch for the usual gun carriage. The pitch, mixed with tar, occupies a hole in the trench bottom, to a depth of about two feet. Into this, the breech of the gun barrel is inserted, resting on an iron plate at the bottom. While the gun is readily turned to any range position, experiments demonstrated that it was not perceptibly thrown out of line by the firing of 20 projectiles, representing nearly 200 lb., its accuracy remaining unimpaired. The earth absorbed all the recoil.

CRIPPLED WAR VETERANS FORM "AMPUTATION CLUB"

"The Amputation Club of British Columbia" has been legally incorporated in Vancouver, and now has a membership of 90 men, who have all been so severely wounded overseas that amputation of one, and sometimes two, limbs has been necessary. The strange club meets twice a month to consider the furtherance of its object, which is the procurement of the most satisfactory artificial limbs on the market. Its most interesting activity so far has been the publication of a Christmas booklet, "The Gold Stripe," which is to be followed, toward the last of this May, by a second volume featuring the soldiers' own stories, illustrated and supplemented by artists and authors throughout the Dominion.

BUZZER-SIGNAL PRACTICE SET USING SMALL TRANSFORMER

For practicing buzzer signaling or learning code, a set operated by a small transformer is more convenient and reliable than the usual dry-cell arrangement. A telegraph key, a buzzer of high pitch, and a bell-ringing transformer, all standard electrical supplies, are easily mounted on a baseboard and connected to form

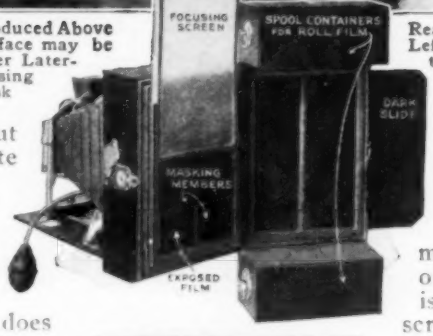


Buzzer-Signal Practice Set, in Which the Usual Battery is Replaced by the Bell-Ringing Transformer on the Right End of the Baseboard: A Standard Telegraph Key and a Small, High-Pitched Buzzer Complete the Set

such a set. The alternating transformer current produces a better signaling tone than battery current.

MANY PICTURES ON ONE FILM IN NEW CAMERA

The Two Sample Films Reproduced Above Indicate How the Film Surface may be Divided into Two Parts, Either Laterally or Longitudinally, by Using Either Part of the Double Mask

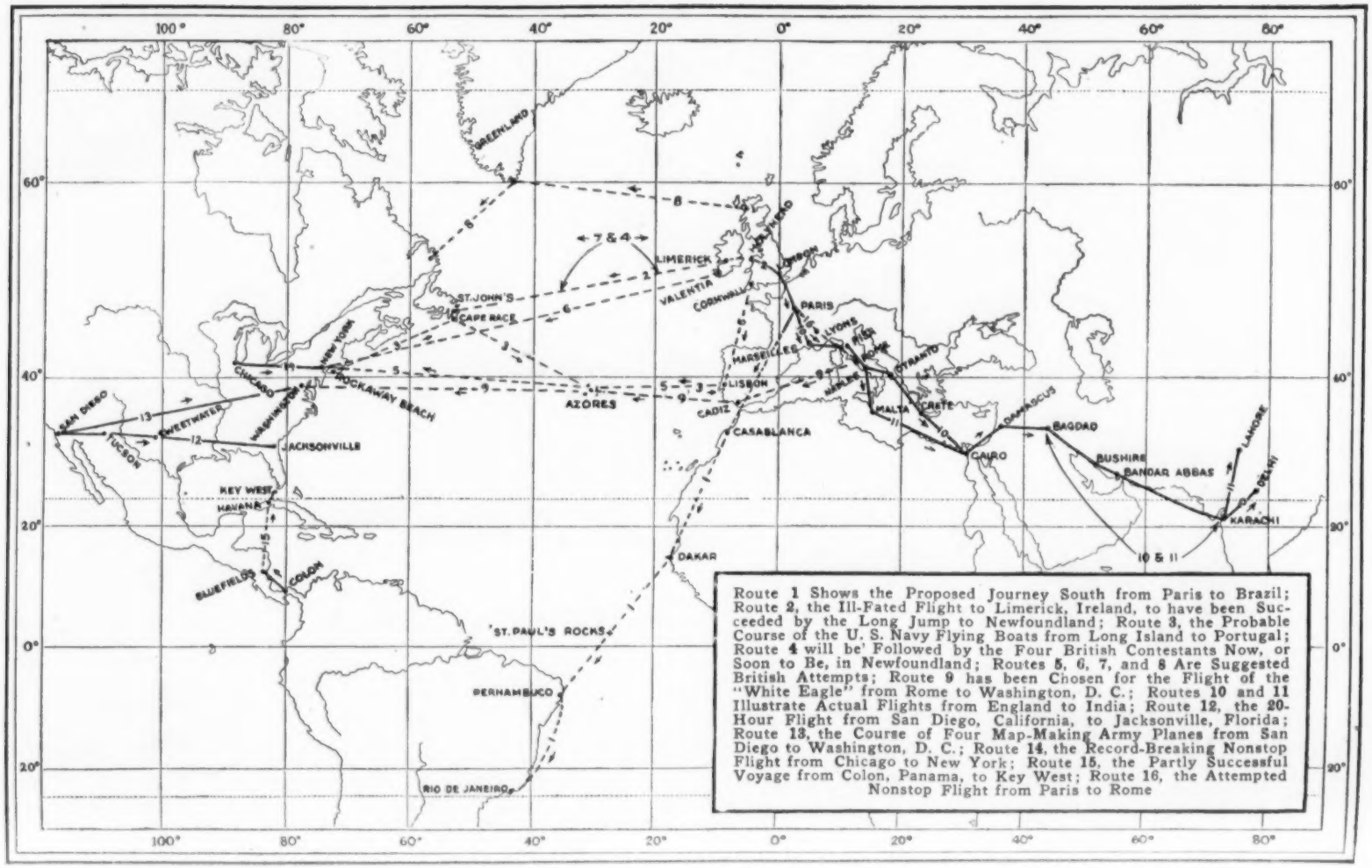


Rear View of the Camera at the Left, Shows the Film Chamber at the Back Open, Revealing the Screen, the Masks, and Exposed Part of Film

As many as eight, out of the hundreds of cute things baby brother does, can be recorded on a single film surface with a Rochester, N. Y., inventor's new camera. In appearance, the instrument does not differ materially from the familiar folding, roll-film, hand camera. Inside, however, are some novel features. The whole back, including the film-spool chambers at the ends, opens on a hinge to give access to the interior, the film then being protected by a slide like those used in plate holders. In front of the film is a sliding mask in two layers, each of which has exposure openings of certain size and shape. By adjusting the relative position of one to the other for each exposure, pictures one-half, one-fourth, or one-eighth the size of the full surface are taken in succession. There is also a focusing screen, which automatically takes the place of the film when the back is opened. Both mask and screen are readily removable, when the device becomes an ordinary camera. The focusing screen, of course, may be used equally well with or without the mask, assuring clean sharp pictures.

¶ Unusual for its location is the vocational school being conducted 14,000 ft. underground in an Idaho mine, chiefly for returned soldiers who are learning the elements of mining in this most practical way. Instruction in operating air compressors, and like tasks, however, is given above ground.

Centered Above Is the Usual Quadruple Division of Film. At the Left It is Seen Divided Laterally into Four Panels, While the Right-Hand Picture Indicates the Maximum Number, Eight, of Exposures on a Single Film Surface



Route 1 Shows the Proposed Journey South from Paris to Brazil; Route 2, the Ill-Fated Flight to Limerick, Ireland, to have been Succeeded by the Long Jump to Newfoundland; Route 3, the Probable Course of the U. S. Navy Flying Boats from Long Island to Portugal; Route 4 will be' Followed by the Four British Contestants Now, or Soon to Be, in Newfoundland; Routes 5, 6, 7, and 8 Are Suggested British Attempts; Route 9 has been Chosen for the Flight of the "White Eagle" from Rome to Washington, D. C.; Routes 10 and 11 Illustrate Actual Flights from England to India; Route 12, the 20-Hour Flight from San Diego, California, to Jacksonville, Florida; Route 13, the Course of Four Map-Making Army Planes from San Diego to Washington, D. C.; Route 14, the Record-Breaking Nonstop Flight from Chicago to New York; Route 15, the Partly Successful Voyage from Colon, Panama, to Key West; Route 16, the Attempted Nonstop Flight from Paris to Rome

MANY TRANSATLANTIC FLIGHT PROJECTS KEEP WORLD'S EYES ON AIRMEN MAKING GREAT VENTURES

JUST as a few years ago the whole world waited agape to hear what fate should befall the persistent Bleriot in his cross-channel flight from Calais to Dover, so for the past few weeks has it awaited the outcome of the proposed transatlantic flight. Much of the thrill of the earlier feat, of July 25, 1909, is absent from the present project. Airplanes within the brief intervening period have been established on a more matter-of-fact basis—so much has been accomplished with them that few are doubtful that whatever within reason man wills to do in this connection will come to pass.

However, it is a most interesting situation to have at the same time so many contestants equipped and poised for the great adventure. Already several have essayed flight and met disaster. But, at the present moment (April 25), Hawker and Raynham, at St. John's, Newfoundland, still chaff each other in friendly spirit while both chafe at the unsettled weather conditions that delay the exploit. On the Atlantic coast the U. S. Navy quietly proceeds with its important preparations. No boasting has come from this quarter, and no entrance for the great purse has been made. It is understood; and probably, should the Navy's plane be the first across, the world would require a few hours to assimilate its surprise. However, the Navy has a name for achievement, which it is well to keep in mind.

While a number of British plane attempts are promised, we hear only a rumor now and then of what they hope to do with the dirigible. Our chart, on the opposite page, makes no accounting of recent dirigible flights, as but few have been traced in detail. However, when we remember that one British machine has remained in the air over 100 hours, it is safe to harbor expectation. The thousands of people who built these craft are staking their hopes on them. When a great venture lies close to the hearts of the masses there is either a menace or a promise of results.

As this magazine goes to press we are on tiptoe with expectation. We could prophesy—we might even luckily guess the outcome. The project is too momentous for such trifling! We only assert that every sincere birdman who wisely equips himself and essays the transatlantic flight—though he meet with sheer failure—is entitled, through his very intrepidity, to share the laurels of the victor.—Editor.

TWO airmen have already failed in the transatlantic race. One, a lieutenant in the French service, has started three times from Paris, intending to follow route 1 (5,500 miles, approximately, as other distances hereafter given), which should lead him from Paris to Casablanca, to Dakar, thence to St. Paul's Rocks in mid-Atlantic, to Pernambuco, and finally to Rio de Janeiro, Brazil.

Another failure was that of an English major on April 18, 1919. He intended to take route 2 (2,500 miles), from the vicinity of London to Limerick on the west coast of Ireland, whence he planned to make the long leap to Newfoundland. His single-motored Short biplane was distinguished by a huge, streamlined gas tank, slung like a torpedo under the fuselage. Trouble developed, however, and he was forced down off Holyhead, Wales, in the Irish Sea. He and his companion were rescued, and the plane salvaged by a destroyer.

Our own naval fliers hope to leave Rockaway Beach, L. I., for the Newfoundland jump-off early in May. Their itinerary up the coast to Newfoundland has been carefully plotted, but their ocean route is still rather problematical. It is likely, however, that route 3 (3,500 miles) will be followed, taking the Americans from Cape Race to the Azores, and from there to some European port, possibly Lisbon. From the four flying boats, NC-1, 2, 3, 4, which are being groomed for the trip, will be selected the two which will actually start. These planes are driven by three or four Liberty motors, are equipped with wireless telegraph and telephone, and in flight will carry a pilot-commander, two duty pilots, one engineman, and one radio operator. The navy will safeguard the fliers in every way, and has detailed one ship for every hundred miles of the route, with sub-chasers to patrol the intermediate areas.

All the British contestants now active seem to prefer route 4 (2,000 miles) which involves more or less straight going from Newfoundland to Ireland. The "Felixstowe Fury," now on its way to Newfoundland, will be piloted by Colonel Porte, R. A. F., remembered in the United States as the designer of the "America" of 1914. His ship is a large triplane with a wing spread of 120 ft., and driven by five motors at a speed of 105 miles an hour. The colonel will be assisted by a crew of five or six men, and will keep his course with directional wireless.

The Handley Page converted bomber should reach Newfoundland early in May. It is driven by four engines and carries about 2,000 gal. of gasoline, enough to keep it in the air perhaps 25 hours. Scores of workers are now building a hangar and grading the aerodrome, 90 miles north of St. John's.

Two other British teams have nearly completed their preparations for the dash from Newfoundland to Ireland. In both cases the exact route is still rather uncertain, as each will depend on the weather encountered. Mr. Hawker will fly a Sopwith two-seater biplane with a wing spread of 46 ft. 6 in., and driven by a single motor. He plans to release the whole undercarriage when a few miles out at sea, and will carry a lifeboat on the fuselage.

Captain Raynham, on the other hand, is making scarcely any provision for a drop into the water, as he is confident that the dash can be made without accident. He will pilot a Martinsyde biplane, similar to the fast British scout of that name, which can develop a maximum speed of 130 miles an hour with tanks full.

Although the four British teams mentioned all intend to take a more or less direct trip to Ireland, several other itineraries have been plotted, viz., route 5 (4,000 miles) from Cornwall, via Lisbon and the Azores, to New York; route 6 (3,000 miles), from Ireland to New York; route 7 (2,000 miles), from Ireland to Newfoundland, and route 8 (2,000 miles), from Scotland, via Greenland, to Canada.

Active preparations are also being made for the voyage of Caproni, in his giant "White Eagle," along route 9 (4,500 miles), from Rome, via Cadiz and the Azores, to Washington, D. C. This great triplane is driven by five motors, and is reported to have a roomy cabin which will accommodate several passengers.

Among flights actually made, are the two voyages by Handley Page machines from England to India. The first, along route 10, started at London, touched at Paris, Marseilles, Naples, Crete, and at Cairo was interrupted to allow the plane to operate against the Turks in Palestine, where it helped to bring the campaign to its successful close. Then it visited Damascus, Bagdad, Bushire, Bandar Abbas, Karachi, and Delhi. The second voyage along route 11, was made over practically the same country, starting on Dec. 13, 1919, at about the time the first flight was being completed, and ending at Lahore on Jan. 16, 1919. Both these flights covered a distance of approximately 7,000 miles.

Three performances by American airmen deserve attention also. The first was a trip along route 12, from San Diego, Calif., to Jacksonville, Fla., made in less than 29 flying hours by an American major in a De Haviland battleplane, at an average speed of 137 miles an hour. The major made a nonstop flight from Tucson, Ariz., to Sweetwater, Texas, a distance of 880 miles by the route followed.

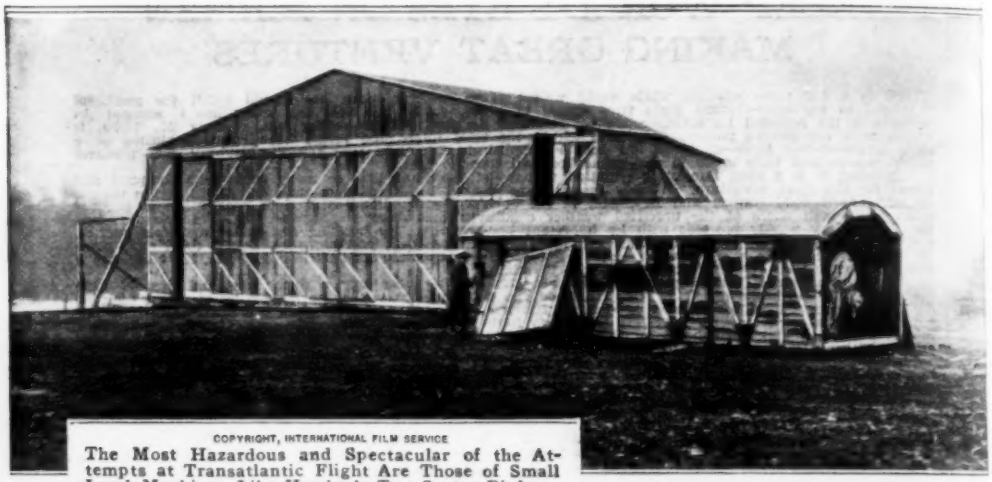
The second, along route 13, was likewise from San Diego, but was made by four army planes, and terminated at Washington, D. C. The trip was made between Dec. 4, 1918, and Jan. 6, 1919, for the purpose of mapping a southern air route through the United States. Only 50 hours of this time were actually spent in flying, however, which shows an average speed of 80 miles an hour for the 4,000-mile journey.

The third was the nonstop flight over route 14 from Chicago to New York, accomplished on April 19, 1919, by an American captain in a De Haviland battleplane, at an average speed of 106 miles an hour. The captain flew at an elevation of 10,000 ft. and was able to make the eastern city in 6 hr. 50 minutes.

Another government plane left Colon, Panama, on April 12, 1919, for Key West, over route 15. The seaplane reached Bluefields, Nicaragua, in five hours, but on leaving Bluefields encountered trouble, and is reported to have abandoned the flight.

One other flight to receive attention lately was that of Jules Védrines, the veteran French airman, who left the vicinity of Paris on April 21, 1919, attempting a nonstop flight to Rome, by route 16 (700 miles). His twin-engined Caudron fell south of Lyons, France, killing both Védrines and his mechanic.

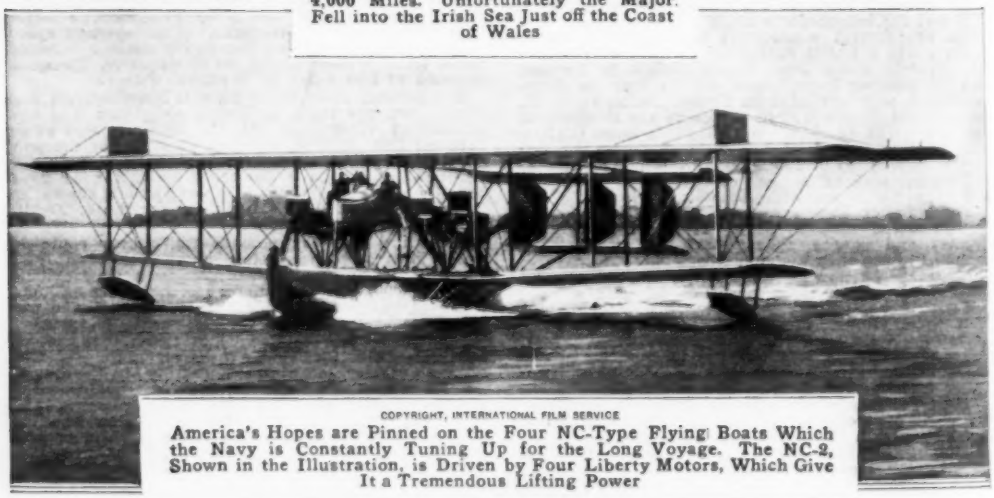
AIRMEN PREPARE FOR TRANSATLANTIC CROSSING



COPYRIGHT, INTERNATIONAL FILM SERVICE

The Most Hazardous and Spectacular of the Attempts at Transatlantic Flight Are Those of Small Land Machines Like Hawker's Two-Seater Biplane, Shown Here in Its Crate on Arrival at the Newfoundland Aerodrome

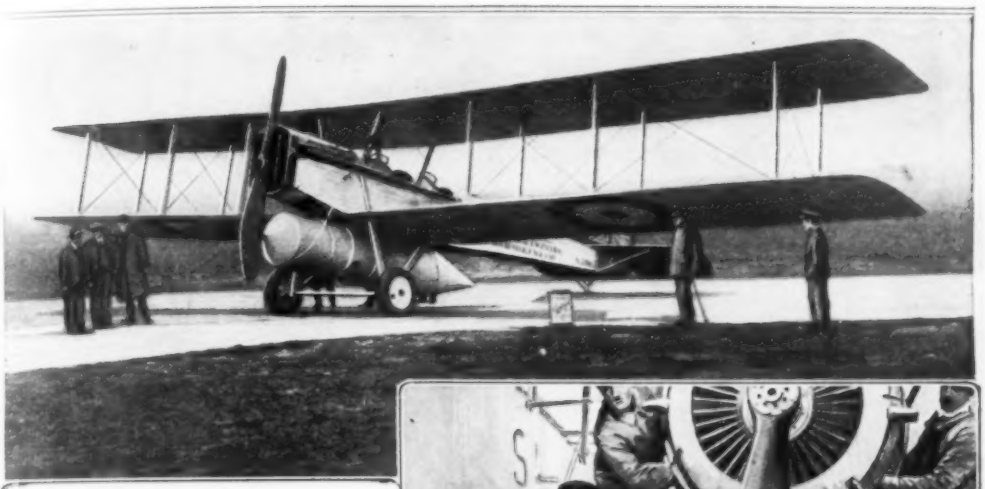
These Workers are Assembling the Short Biplane with Which Major Wood Recently Attempted the Westward Flight. The Machine Is a Two-Seater with a Computed Flying Range of 3,000 to 4,000 Miles. Unfortunately the Major Fell into the Irish Sea Just off the Coast of Wales



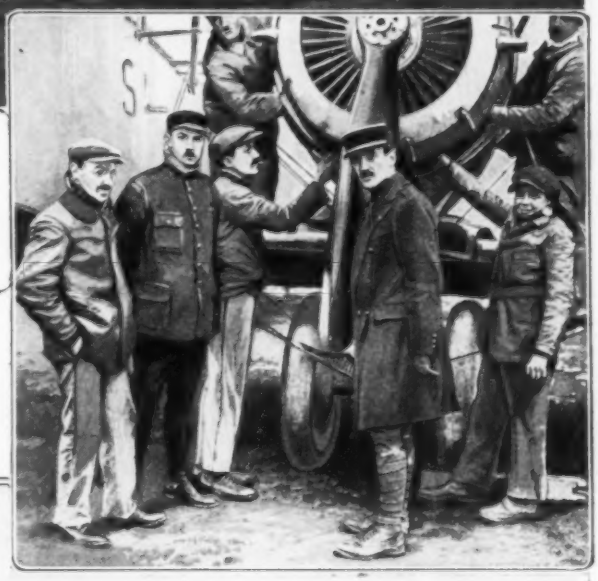
COPYRIGHT, INTERNATIONAL FILM SERVICE

America's Hopes are Pinned on the Four NC-Type Flying Boats Which the Navy is Constantly Tuning Up for the Long Voyage. The NC-2, Shown in the Illustration, is Driven by Four Liberty Motors, Which Give It a Tremendous Lifting Power

UNDAUNTED BY DISASTERS ALREADY ENCOUNTERED



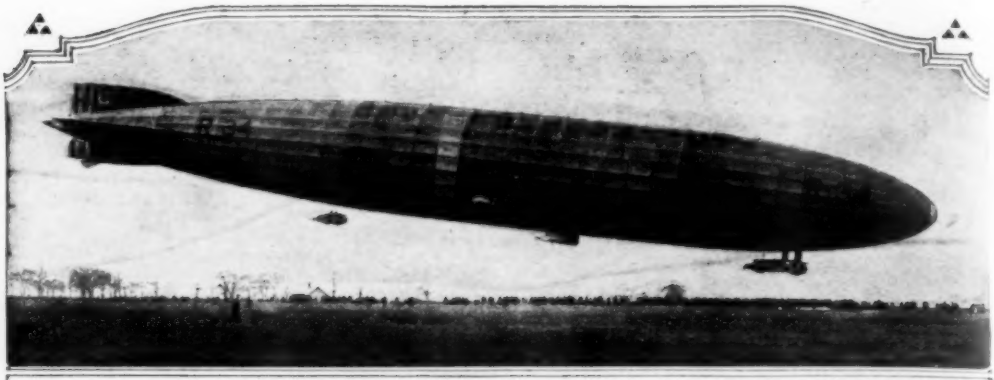
This Is the Biplane That Fell into the Irish Sea on One of the First Transatlantic Attempts. Its Most Peculiar Feature Is the Great Gasoline Tank Slung under the Fuselage, So That It might be Emptied to Serve as a Pontoon in Case of Forced Landing in the Water



Lieutenant Fontan, Standing beside the Propeller at the Right, has Three Times Attempted to Bring the Laurels to France. His Projected Route will Carry Him South from Paris, along the West Coast of Africa, to Cape Verde, from Where He will Try the Flight to Brazil with a Mid-Ocean Stop at St. Paul's Rocks

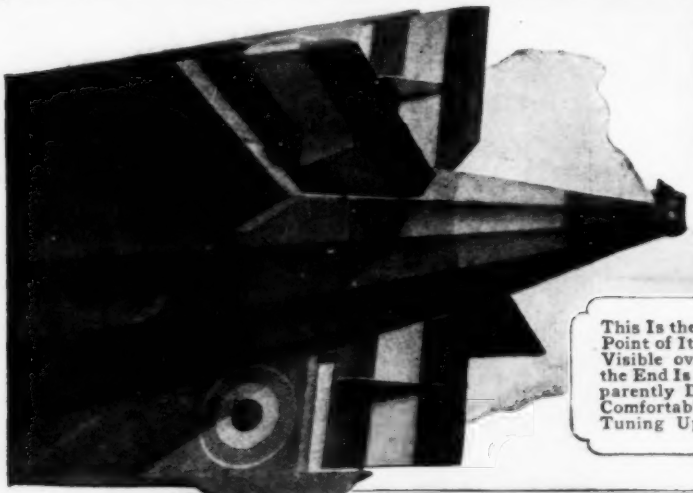
Lieutenant Fontan has Used a Twin-Motored Caudron Bomber for His Trials, Which Probably Have the Backing of the French Government. A Glance at the Map will Show That His Route will Carry Him across the Atlantic at Its Narrowest Point. It Is Only 1,800 Miles from Dakar to Pernambuco, Brazil, over the Steamship Route

TWO NEW DIRIGIBLES ARE ENGLAND'S LARGEST

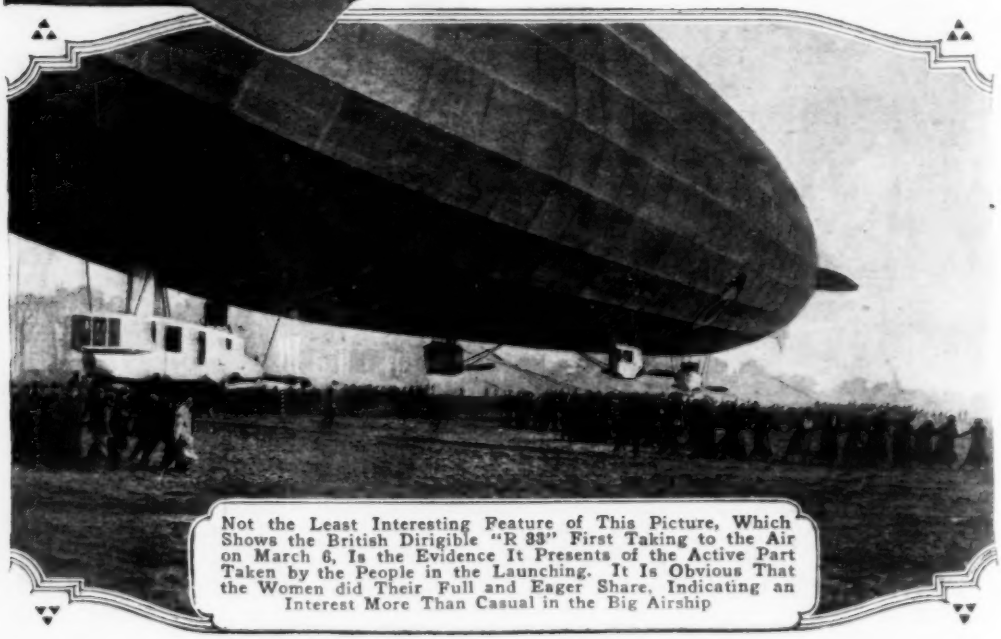


COPYRIGHT UNDERWOOD & UNDERWOOD

Great Britain's Newest and Largest Dirigible, the "R 34," Descending in the Fields along the Clyde after Its Trial Trip of Four and a Half Hours: The Launching, on March 14, Was a Great Popular Event, and Over Four Hundred Spectators, Both Men and Women, Assisted. The "R 34" Is 670 Feet Long, Exceeding Its Sister Ship, the "R 33," by a Few Feet



This Is the "R 33," or Rather the Extreme Point of Its Tail. The Minute Object Just Visible over the Edge of the Cockpit on the End Is an Observer, Who Finds the Apparently Diminutive Quarters Roomy and Comfortable. On This Trip the "R 33" was Tuning Up for the Transatlantic Trials



Not the Least Interesting Feature of This Picture, Which Shows the British Dirigible "R 33" First Taking to the Air on March 6, Is the Evidence It Presents of the Active Part Taken by the People in the Launching. It Is Obvious That the Women did Their Full and Eager Share, Indicating an Interest More Than Casual in the Big Airship

These Motorcyclists have Left Sydney, Australia, for London, England. They are to Make a Rough Survey for an Aerial Mail Line between Those Cities. All Supplies for the Dangerous Trip, Including a Well-Stocked Medicine Chest, a Generous Gasoline Reserve, and Plenty of Revolver Ammunition, are Carried in the Sidecars

MOTORCYCLE PARTY SURVEYS LONG AIR ROUTE

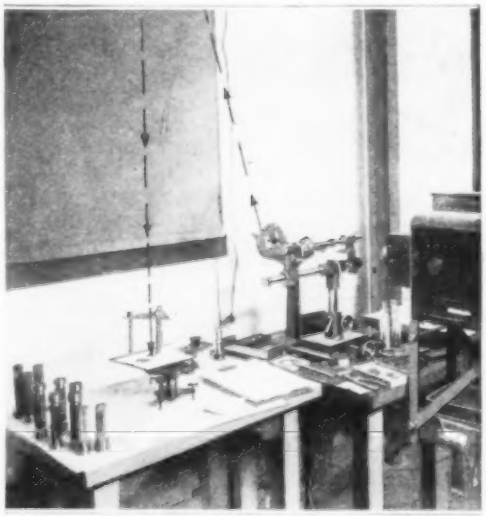
An expedition of six men, riding motorcycles and carrying their supplies in sidecars, has left Sydney, Australia, for London, England, in an effort to survey a route for an aerial mail line that is being backed by a commercial company. To handle the many problems that will arise during the hazardous journey, the company has chosen six men of various professions, among them a journalist, a French airman, an expert mechanic, and a surveyor and photographer. These men hope to locate suitable landing fields about every 300 miles along the long trail, that will lead them north through New South Wales, across 500 miles of sand in the Northern Territory, over the islands of Timor, Java, and Borneo, to Singapore; thence up the Malay Peninsula, and west across India and Persia to Suez, where the party will board ship for London. The motorcycles being used are standard models, with only a few alterations made for the difficult roads that will be met. Springs have been strengthened, gasoline and oil tanks enlarged, and the gear ratio somewhat reduced.

ARMY'S RECONSTRUCTION WORK PERMANENTLY RECORDED

In order to conserve and apply the valuable lessons learned at the army's many physical-reconstruction hospitals, it is now required that the chief educational officer in each institution prepare a historical sketch, showing the growth of the work by accurate details and figures. These records of knowledge gained and methods established are to be filed by the government as a permanent aid to civil as well as military hospitals.

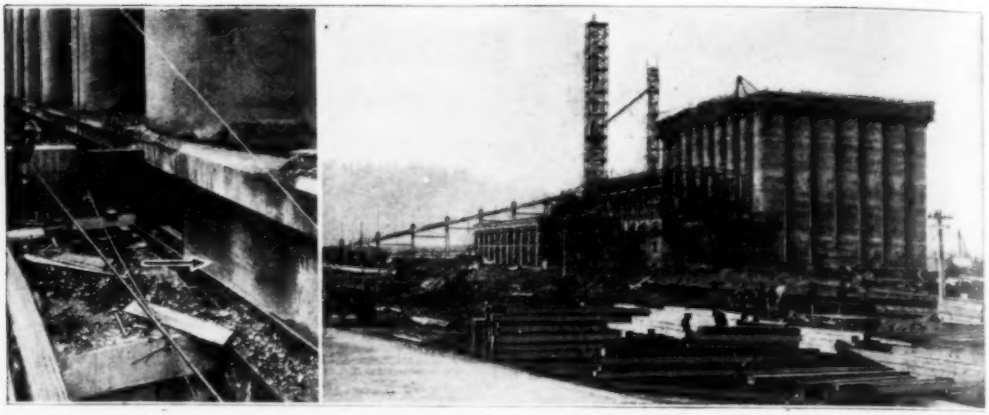
PROJECT PICTURES TO TEST SCREW-THREAD ACCURACY

Exact accuracy was a stringent requirement for all of the thousands of screw-threaded parts used on war equipment. The threads were tested by the ingenious method of projecting a magnified picture of them on a screen. The screen itself was a small horizontal metal stand, provided with a vernier adjustment. A straightedge, rigidly supported above the stand, cast a shadow on the screen



Method of Projecting Screw-Thread Images for Test Measurements: The Screw Is Back of the Objective Lens to the Right in the Picture, and the Light Rays, Directed Upward by a Prism, are Reflected Back to the Screen Instrument to the Left by a Ceiling Mirror, Not Shown

at the correct angle for comparison. The light rays from the projecting lantern were turned upward by a prism, and a mirror on the ceiling directed them down to the screen. The screw to be tested was supported just behind the objective lens.



The Great Weight of the Concrete Grain Elevator Shown in the Larger Picture Caused It to Sink 13 Inches. The Smaller Building Which Shelters the Power Plant did Not Sink, However, So the Reinforced-Concrete Connections between the Two had to be Cut, as in the Picture to the Left

SMALL WATER HEATER CAN BE PACKED IN TRAVELING BAG

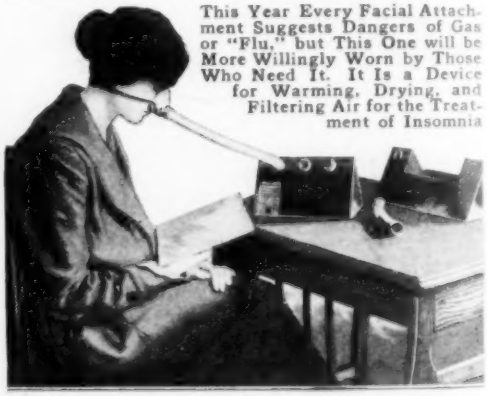
A small electric water heater, only 12 in. high, is now manufactured for attachment to a kitchen or bathroom faucet, directly or with a rubber tube. The water then flows through porcelain tubes in which noncorrosive resistance coils heat it progressively to the required temperature. The faucet from which the heated water is finally drawn is so associated with the electric snap switch that the current is not turned on until the hot water is actually wanted. If cold water is desired, the faucet handle is thrown in a reverse direction, causing the water to flow through an unheated by-pass. The machine can heat about 30 gal. an hour, using either direct or alternating current.

CONCRETE GRAIN ELEVATOR SINKS THIRTEEN INCHES

When it was decided to construct a municipal grain elevator of 63 bins at Portland, Ore., weighted piles were driven on the site selected to determine the nature of the ground. At the end of four weeks no settling was discovered, and construction was begun. But when the heavy bins had reached their final height of 85 ft., the structure began to sink, rapidly at first, then slowly, stopping at a depth of 13 in. Experts were called who found that the sinking would not continue; so work recommenced. The structure is now four inches out of level, however, and the reinforced-concrete belting tunnels had to be cut to prevent damage to the adjoining building, which houses the power plant.

INSOMNIA TREATED BY DEVICE SUPPLYING WARM, DRY AIR

An English scientist declares that insomnia may be cured by removing excess moisture from the lungs. To put his theory into practice, he has devised a small machine for supplying warm, dry, filtered air, which the patient then breathes through a nose tube secured to the head with tape. The process is said not to be uncomfortable.



This Year Every Facial Attachment Suggests Dangers of Gas or "Flu," but This One will be More Willingly Worn by Those Who Need It. It Is a Device for Warming, Drying, and Filtering Air for the Treatment of Insomnia

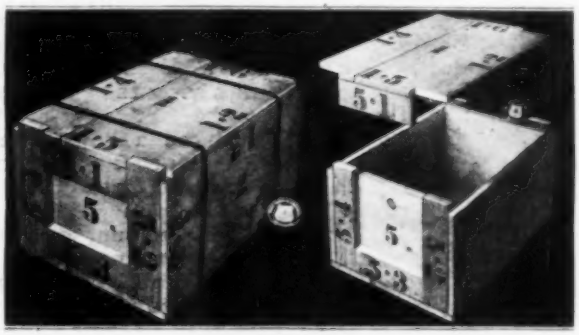
BETTER PACKAGES AND HOW THE WAR BROUGHT THEM OUT

By BRANDON TRACY

"$*!&%!No.!!"

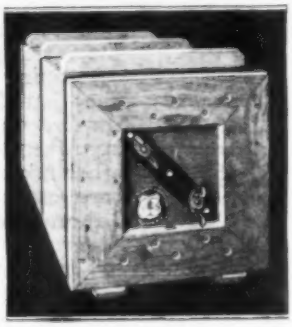
Call this low-spoken, earnest expletive "Oh, fudge!" if you will. In civilian life the latter usually suffices. It is not the way men talk at 3:00 a. m. in the firing bays, with the big push against the Germans due at 3:18, zero hour—and the hand-grenade boxes for the whole platoon still tightly nailed. What Eugene Field called "virile Anglo-Saxon that would never do in print" is tried out, and usually found wanting.

In this particular instance men were required to open and unpack grenade boxes, distributing the contents among the bombers, and do it all without arousing the suspicion of Fritz's sentinels, 60 yards away. One squeak of a rusty nail being drawn, and the attack would fail, in all probability. Little hints of this kind are given full valuation in the trenches just before dawn.



The Hand-Grenade Box at the Left can be Opened in a Dark Trench without the Slightest Noise to Betray the Coming Attack. At the Right the Binding has been Cut

The boxes never were opened that day. Though a dozen men sweated and swore because the work had not been done earlier, there was no chance of accomplishing it without noise. Each time one of the boards of a cover was pried, it gave a warning squeak that made the worker stop, cold beads of perspiration standing out on his forehead. The platoon "went over" with practically no bombs at all.



This Hand-Grenade Box is Likewise Easily and Silently Opened. In This Case, the End is Held with Bolts and Screws

A report of this incident came back through official channels, and the Forest Products Laboratory, at Madison, Wis., was given the problem of designing packing cases for ammunition that could be opened anywhere on the road to Berlin without disturbing the most suspicious Boche. Immediately two designs of boxes were presented. The first had a bolt-and-screw end construction; when the screws were removed the end came off noiselessly, revealing the contents. The second was of slightly stronger design, intended for heavier contents. No nails or bolts were used; the top dovetailed with the edges and was held down by two tight strips of iron sheeting passing entirely around the box. Noiseless clippers for this sheeting made it possible to unpack this box anywhere, and its strength could be depended upon. The two designs were adopted at once, and used for the duration of the war.

On the eve of hostilities with Germany, the wood experts of the Forest Products Laboratory offered to help out the Ordnance Department of the United States Army in providing containers for overseas shipping. This was declined politely. The Ordnance Department considered the problem of getting boxes merely a question of getting sufficient money to spend.

On April 7, 1917, it sent out specifications for several types of boxes needed immediately, asking for bids. The contracts would have involved $3,000,000. Two weeks later the Forest Products Laboratory was summoned in consultation. Not a single bid had been sent in by box manufacturers!

The forest-products expert detailed to the problem found that the box specifications called for white pine, and also that the sizes named made it necessary for manufacturers to desert their long-established practice of making boxes from waste ends of lumber. The new boxes would have to be constructed from new

lumber, if at all. He simply redesigned the containers, altering the specifications so that waste ends could be used; and knowing that the United States just then was suffering from a bad shortage of white pine, he substituted a group of other woods for this material in the specifications.

As soon as the new specifications went out, bids came in by return mail and the Ordnance Department had no difficulty of the kind thereafter.

Because of this incident, when the Forest Products Laboratory respectfully suggested that much space could be saved for the government by redesigning all the other boxes used in overseas shipping, the experts were allowed to tackle the new problem.

The Experts at the Forest Products Laboratory Evolved This Machine to Strain Packing Cases in All Directions. If a Box Survives This Test It will Travel Safely under Any Conditions. The Machine is Here Shown Submitting a Box to a So-Called Cornerwise Compression Test

The first box changed carried 30 one-pound cans of saddle soap abroad. The new design saved 43 per cent of the cargo space required by the old box—cargo space cost the government $6 a cubic foot throughout the war—and made a stronger, though lighter and less expensive, container. On the first shipment of 3,000,000 lb., the government pocketed a saving of $414,000 net.

All the powder and high-explosive boxes suffered alteration. Of these, the best example is the container which carried 140 lb. of cannon powder. Fourteen per cent in space was saved.

One container intended to hold two Browning automatic machine guns with full equipment was found to be wasteful of space. Twenty-eight per cent of the total it required was eliminated, and the crate made at a saving of 40 cents in lumber. Every time two of these rifles crossed the Atlantic, Uncle Sam put back $5.77 into his breeches pocket. As the guns went over at the rate of nearly a thousand a day for several months, his pocket must have bulged.

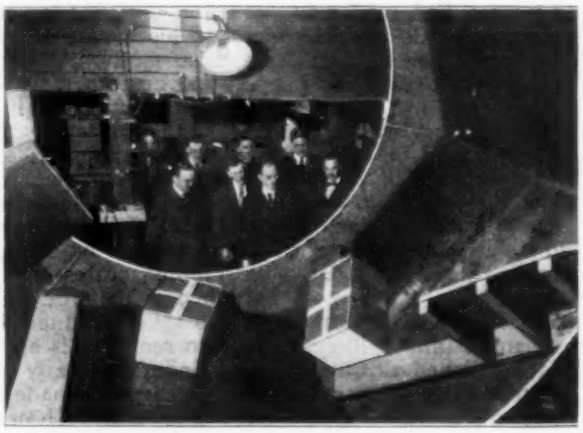
Ten infantry rifles, model 1917, went overseas in a single crate. Approximately four million in all were shipped abroad. Three million or more will be shipped back. Each single trip of one million rifles saves the government $1,500,000, due to the fact that forest-products experts produced a new crate that housed the rifles with an apportionment of ¼ cu. ft. less space for each.

In addition to the great amount of money saved in this manner, there is a still larger sum to be mentioned. After the boxes designed by the Forest Products Laboratory were put in use, the losses from breakage suffered by the government were less than 15 per cent what they had been previous to the adoption of the new boxes. In all, adding the savings made by new waterproof case-lining paper, by the introduction of fiber handles to take the place of rope handles on ammunition cases, by various improvements on strapping, seals, and on other minor accessories and details, it has been estimated that the Forest Products Laboratory saved upward of $30,000,000 of government money—more than enough to justify the existence of the organization till eternity, even if not another stroke of work ever were done by the organization.

The laboratory, however, is only at the threshold of its usefulness. In the period of reconstruction now before us, considering the phase of box construction alone, the organization stands ready and able to save for industry in the United States and export shipping at least $10,000,000 a year. This money will be put back into the pockets of the box manufacturers and box users; every shipper who sends anything in a container made of wood, paper, or fiber will benefit, and indirectly, every

consumer of products thus conveyed will save money.

As a striking example of how this saving will be accomplished stands the case of electric lamps. Recently a manufacturer decided that the boxes in which lamps were sent to jobbers were inefficient and wasteful. Approximately nine per cent of the lamps were either smashed, or jarred until the filaments were broken. The company consulted the experts of the laboratory, who advised that a shipment of $4,000 worth of lamps be sent up, with some standard containers, for test.



A Group of Electric-Lamp Manufacturers Wanted to Find a Packing Case That would Deliver Their Fragile Products Intact to the Customer. The Revolving Drum Shown Above Made the Tests

The boxes, together with some designed at the laboratory for this use, were given the compression-along-edge, cornerwise, and drop tests. The first, as its name implies, is a steady and constantly increasing pressure applied along any edge, and with the opposite edge in direct line with the pressure exerted. One of the illustrations shows the machine for this test and how it is used. The same machine is used for the cornerwise test, which really is the same, except that the force is exerted on two opposite corners instead of edges. Combined, these two measure the strength of the box in withstanding any external pressure, and approximate the hazard suffered by lower tiers of boxes in a pile.

The drop test is given by means of a huge hexagonal revolving drum, rotating slowly. The box is packed with its actual contents, as in commercial service, and placed in the drum. On the inside faces of the drum is arranged a series of hazards, which causes the box to follow a regular cycle of drops, falling on sides, top, bottom, edges, corners, and flat upon a sharp projection similar to the corner of another box. With the two former tests, this gives a box all the hazards it encounters in actual service anywhere.

The lamp boxes were found to be insufficiently insulated against shock for their valuable and fragile cargo, weak on the edges, and poorly balanced. New boxes were designed which eradicated most of the loss from these causes, and at the same time saved money in the box construction itself.

The lamp containers happened to be made of fiber, but usually a great deal more can be saved in the case of wooden boxes or crates. The weak features that stand out usually are too few nails, nails of too short a length, or nails driven in the wood in some manner so that shocks, drying, or strain pulls the wood from the nails, or causes it to split or break across the grain.

When delegates from the national associations of box manufacturers, wholesale grocers, and canners met in joint committee in Chicago, recently, the point of how many nails should be used to a box edge was brought up. Three nails to the edge had been the accepted practice, but some thought more would give better service. A forest-products expert was consulted.

He recommended at least six nails to the edge in a standard No. 3 can crate, and told the delegates that even seven or nine nails would give additional benefits. When this provoked laughter, he invited the delegates to accompany him to Madison. There he repeated the tests he had made previously on these boxes, and when the guests left they had decided upon seven nails to the edge as being more than three times as efficient as the old plan. They had been convinced that the scientific nailing of their boxes meant many thousands of dollars in their pockets annually.

After the extraordinary experience of the Ordnance Department with the box experts, Col. D. W. Dunne, chief inspector of the Bureau of Explosives, declared that it was his belief that at the present time all industry which is dependent upon containers made of wood, paper, or fiber

for shipping, is losing from 25 per cent to 50 per cent of the cost of that shipping through lack of knowledge which now is possessed by forest-products experts. He stated that a saving of a full third could be made on all package shipping, whether domestic or export, simply by redesigning the containers to make them more economical of space and wood, and, at the same time, stronger for the protection of their contents.

Colonel Dunne advocates Federal laws establishing standard boxes of all descriptions and for all present purposes, these boxes to be designed by the Forest Products Laboratory, and put into use before the government returns the railways to private ownership. This would be a tremendous task, for every existing business today has its distinctive—and distinctively wasteful—shipping box or crate, and for each individual article the most economical container is different from that necessary for another.

It probably could not be done before private ownership returns, but still it might as easily be accomplished through the agency of the Interstate Commerce Commission. The railroads could not put it over by themselves, for as soon as one group tried to dictate to shippers the whole of its business automatically would transfer itself to another line or group of lines. A saving of 35 per cent, however, is worth thinking over.

The project ought to come home to the shrewd Yankee business man also. The president of the American Railway Express Company recently put it in apt phrase: "It is an everyday fact that the American business man has learned to regard a satisfied customer as a direct asset to his business. He would do nothing that might jeopardize his relations with that customer. If the goods he sends that customer arrive in bad order, however, if the contents are damaged or pilfered because they are exposed during the journey, the customer does not wait for an explanation, but places his business elsewhere. Isn't it worth while for him to stop right now and make certain that his shipping crates are the very best procurable for his product?"

The Forest Products Laboratory stands ready to render this advice, in most cases free of charge, to any concern who asks. Where charge is made it is apportioned, and the laboratory bears part of the burden.

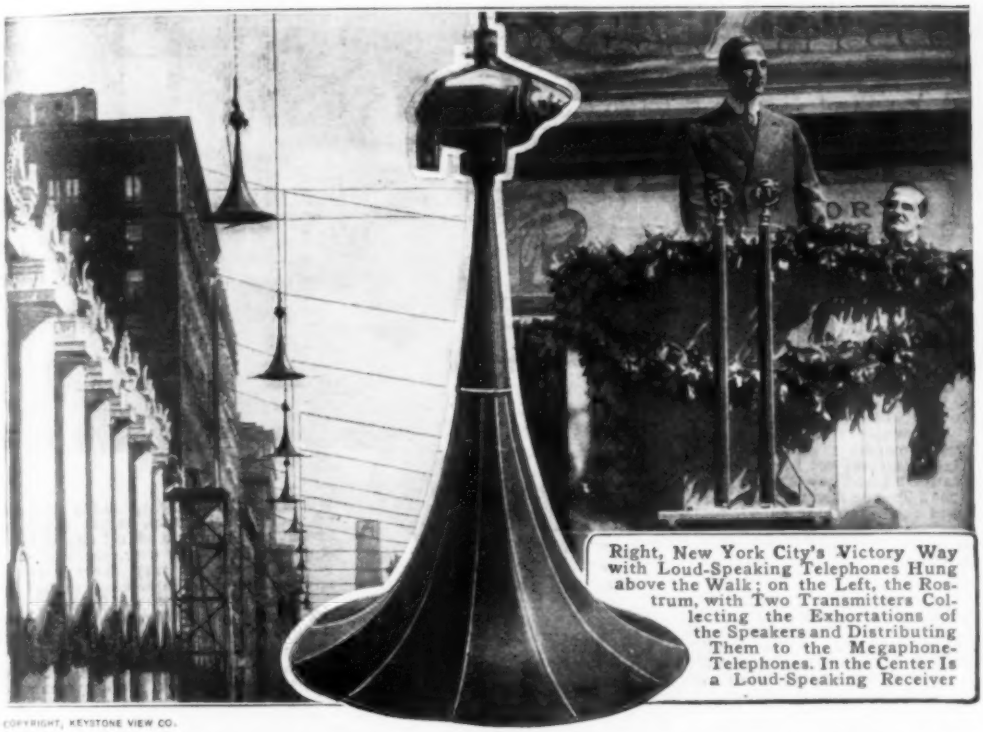
INDICATORS ON SUB CHASERS SPOTTED U-BOATS

Adjustable arrows, six feet long, like the one in the illustration, proved of great value in several ways on American destroyers and sub chasers. By a prearranged interpretation of various settings the movements of the arrow could be used to govern convoy formations. Thus, turned to the right, it might mean "Close Up," or to the left "Increase the Interval." Another, and more obvious use, was in conjunction with the submarine-detector tubes which registered the position of a submerged U-boat. Thus, when one destroyer or sub chaser learned the foe's position, a simple manipulation of the arrow spread the knowledge to the whole convoy. It will be seen that the indicators may be illuminated for night signaling.

Left: The Arrow Indicator Mounted on a Sub Chaser. Right: The Gear That Holds It in Position

BALLOON OBSERVERS TO STAND GUARD OVER FORESTS

It is safe to predict that destructive forest fires will soon go out of fashion as a result of the many preventive measures being taken. Quite the latest is the forest balloon service. Experiments at an army balloon school have shown that the innovation is entirely practicable, and most efficient when in the hands of trained observers, who can spot a blue wisp of smoke miles away. The observer's telephone will be an essential part of the system that will spread the fire alarm through the great forests.



Right, New York City's Victory Way with Loud-Speaking Telephones Hung above the Walk; on the Left, the Rostrum, with Two Transmitters Collecting the Exhortations of the Speakers and Distributing Them to the Megaphone-Telephones. In the Center Is a Loud-Speaking Receiver

COPYRIGHT, KEYSTONE VIEW CO.

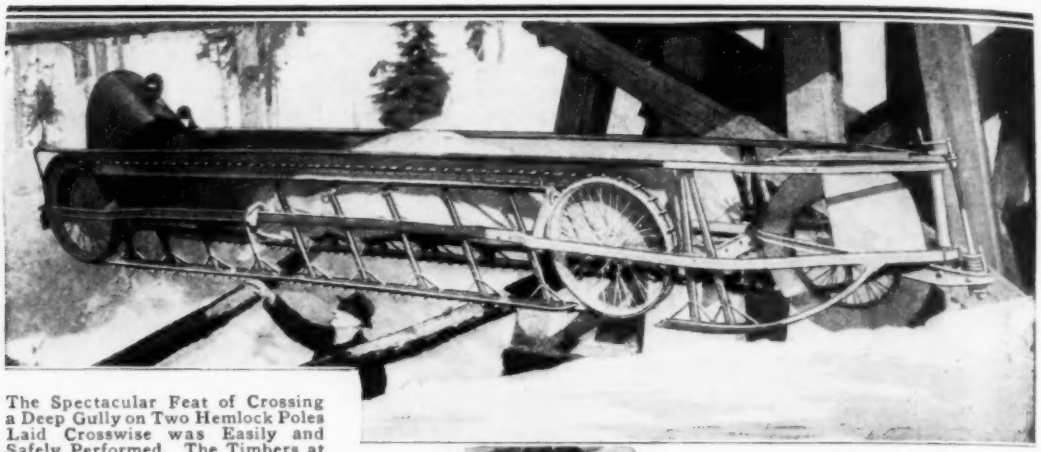
CROWDS HEAR VICTORY-LOAN SPEECHES FROM AIR THROUGH VOICE MAGNIFIERS

Gathered before the Treasury Building in Washington, during the Victory-loan campaign, a large crowd heard every word of a speech delivered by an airman flying 3,000 ft. above their heads. The invention that made this possible is a new sound-magnifying receiver, designed by two San Francisco men. The sensitive diaphragm of this instrument, which builds up and strengthens the infinitesimal vibrations of wireless-telephone transmission, has the usual receiver earpiece replaced by a huge resonating horn. The voice amplifier was connected to the terminals of the aero-radio apparatus, into whose transmitter, in the plane above, an army officer delivered President Wilson's Victory-loan appeal.

Meanwhile, amazed throngs along New York City's great Victory Way heard, literally descending upon them from above, the words of public speakers in stirring pleas for the loan. Suspended from wires strung far overhead were dozens of loud-speaking telephone receivers, their bell-shaped horns pointing vertically downward toward the walk. From their terminals the wires led to a pair of transmitters, mounted on pedestals before the speakers' rostrum. By this means the words addressed to those gathered about the platform were spread broadcast along the thoroughfare.

Looking into the Horn of the Radiotelephonic Voice Magnifier, from Which the Crowd before the Treasury Building Heard the Speech of an Airman Flying More Than a Half Mile Above Them

ACROSS THE CASCADE RANGE IN A MOTOR SLEIGH



The Spectacular Feat of Crossing a Deep Gully on Two Hemlock Poles Laid Crosswise was Easily and Safely Performed. The Timbers at the Right Suggest the Proximity of Civilization; but They Are Part of a Railroad Trestle Abandoned Years Ago, and the Trail Is Rough and Wild. Incidentally, the Sled Is in Position for a Good View of Its Construction and Mechanism

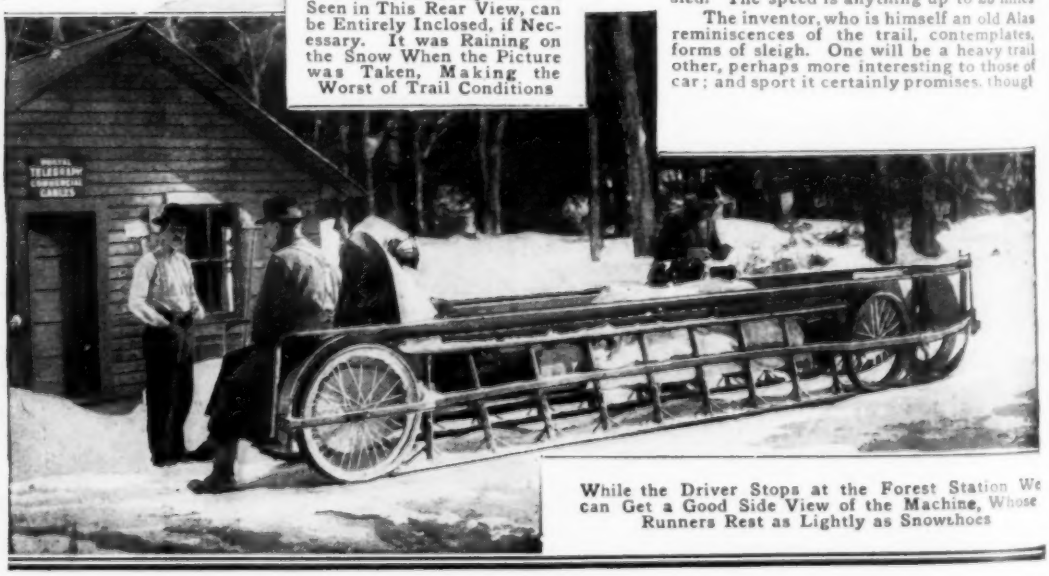
The Driver's Compartment, Seen in This Rear View, can be Entirely Inclosed, if Necessary. It was Raining on the Snow When the Picture was Taken, Making the Worst of Trail Conditions

ALMOST as amazing as the first perfor tacular trial trip, across the Cascade advent was announced in Popular Mechan of snowfalls old or new, scornful alike of vehicle broke its way through primeval of an automobile, hopelessly stalled in the incident in its progress. Crossing a deep one of the day's adventures. Small wonder miring witness of the whole performance quill"—whatever that may be.

The intended substitution of the motor ka's snowbound post trails means more to may be generally realized. Jack London a romantic figure; but the followers of the the elimination of much human hardship, ommends the gasoline method.

The motor sled itself, already described but 3 ft. wide and as many high. Its air- has a channel port in its jacket for the torch before starting on a 40° below- multiple-disk clutch are of regular type, severe duty. The drive, to the rear wheels, needed on a snow surface. The body has along under them, and consisting of three steel lugs are set on the cables at a surface- on its steel-channel frame, reproduces the sled. The speed is anything up to 25 miles

The inventor, who is himself an old Alas reminiscences of the trail, contemplates, forms of sleigh. One will be a heavy trail other, perhaps more interesting to those of car; and sport it certainly promises, though



While the Driver Stops at the Forest Station We can Get a Good Side View of the Machine, Whose Runners Rest as Lightly as Snowshoes

DISDAINFUL OF TRAILS, DRIFTS, OR WINDFALLS

A 12-Inch Fall of Snow Caught the Sliding Auto This Time, but It Makes No Difference. With a Moment's Application of the Gasoline Blowtorch the Engine Starts and the Sled Is Off Again. It Needs No Trail Breaker, Sliding over the Snow Like a Hydroplane over Water

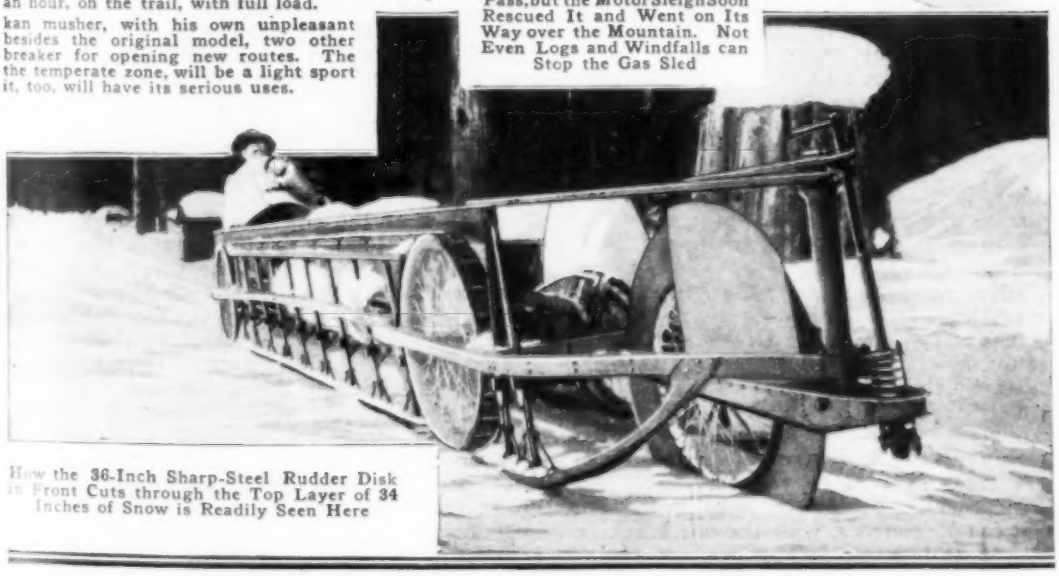
mances of the army tank was the spec-
Mountains, of the motor sleigh whose
ics last month. Skimming the surface
trails or obstacles, the strange little
passes with never a stumble. The rescue
drifts of Snoqualmie Pass, was a mere
gully on a pair of hemlock poles was but
that the forest ranger who was an ad-
exclaimed that the gas sled was "the real

sleigh for the dog-drawn sledges of Alas-
the people of that great territory than
and others have limned the malemute as
trail know well he is never that. It is
as well as canine inefficiency, that rec-

as 25 ft. long and 900 lb. in weight, is
cooled, 22-hp. motor, aluminum-housed,
momentary application of a gasoline
zero Alaskan morning. Gear shift and
but all parts are large and heavy for
is by worm gear; but no differential is
runners like any sled, the tread passing
endless steel cables on each side. Hard-
gripping angle. The rigid hickory body,
rawhide-braced basket of the typical dog
an hour, on the trail, with full load.

kan musher, with his own unpleasant
besides the original model, two other
breaker for opening new routes. The
the temperate zone, will be a light sport
it, too, will have its serious uses.

The Automobile Was Helpless in the Snowdrifts of Snoqualmie Pass, but the Motor Sleigh Soon Rescued It and Went on Its Way over the Mountain. Not Even Logs and Windfalls can Stop the Gas Sled



How the 36-Inch Sharp-Steel Rudder Disk in Front Cuts through the Top Layer of 34 Inches of Snow is Readily Seen Here

The Picture at the Left Shows the Pigeon Case as Carried along the Forest Trails. In the Center It has been Opened ; at the Right It is Collapsed

PIGEONS TO AID IN PATROL OF NATIONAL FORESTS

Homing pigeons, carried by forest rangers on their patrols, will this season supplement the telephone lines which ordinarily spread the alarm of fire. Rangers in two Oregon forests are to be equipped, and breeding stock has already been obtained from a Portland association. As the eggs hatch, the older birds will be set free to return to the home loft, while the youngsters will be kept and trained in their special duties. They will naturally be of most value in remote sections where wire communication is uncertain and liable to failure, or perhaps does not exist at all. A ranger can carry five birds in a light, collapsible traveling case.

TANGLED WAR STORIES CONFUSE PUBLIC

By PAUL JENKINS

PRESS and platform hailed the marines as the saviors of Chateau-Thierry, not understanding—as it eventuated—that these intrepid fighters were not located in the town itself but rather in the Chateau-Thierry neighborhood. The fact that there were two American engagements in this region helped increase the confusion of ideas. Even our own account of the splendid marksmanship of the marines published on page 259 of the February issue contained some inaccuracies of date and location, which we believe the following summary of American operations in Chateau-Thierry proper will serve to correct.—Editor.

Already the story of America's part in the war is obscured in many details by a confusing growth of legends and inaccuracies. And nowhere do the myths hang thicker than about the name of Chateau-Thierry, where America's citizen-soldiers first met and mastered the Hun in an operation of major importance. In the case of Chateau-Thierry, this regrettable confusion has arisen, primarily, because the name is often loosely used for the whole vicinity, including a dozen near-by hamlets, and, secondarily, because two distinct engagements were fought here during the summer of 1918.

A review of the local operations of May, June, and July, 1918, will clarify the story, and bring a more equal share of justice to all concerned.

The third German offensive of 1918, started on May 27, swept across the Chemin des Dames, over the Aisne River, over the Vesle River, and reached Chateau-Thierry on May 31. Here it was halted by the French, assisted, in the city itself, by the 7th Machine Gun Battalion, 3rd Div., U. S. A. This battalion held the bridgeheads and struggled with the enemy in the northern outskirts of the city from May 31 to June 4.

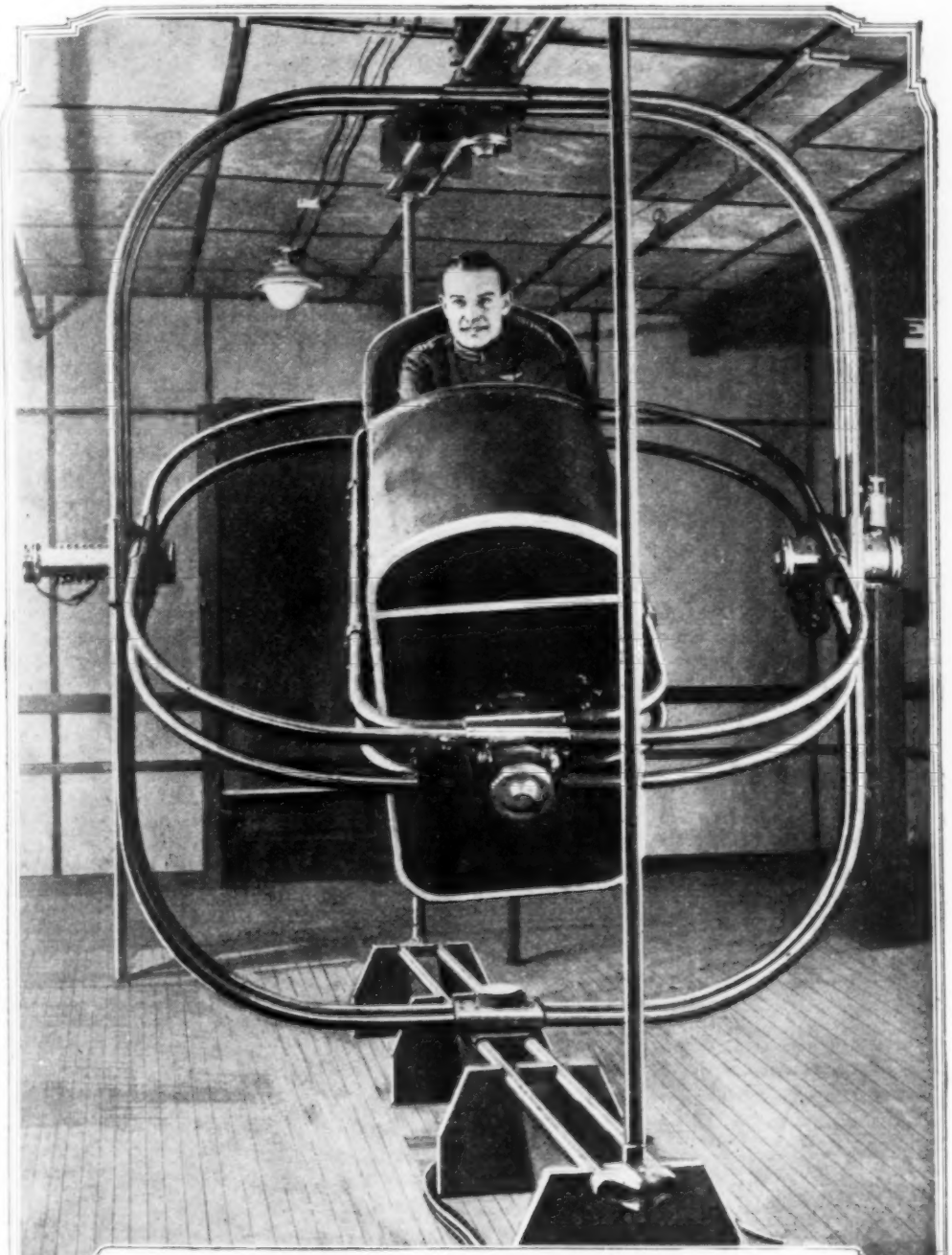
Meanwhile, beginning June 2, the 5th and 6th Regiments, with the 6th Machine Gun Battalion, U. S. Marines, were winning undying fame, four or five miles to the northwest of the city. Checking the Germans for four days, they counter-attacked on June 6, 1918, and during the next few days pushed straight through the tangled underbrush of bloody Belleau Wood.

Thus, although they did no fighting in the city itself, the Marines helped save Chateau-Thierry by removing menacing pressure from the northwest.

And finally, on July 15, 1918, came the fifth great Hun offensive, ushered in by a bombardment of the 60-mile front from Chateau-Thierry eastward to Massiges. Unsuccessful at most points, the Germans did succeed in crossing the Marne along the 12 miles east of Chateau-Thierry. And this time the city was garrisoned by the French alone, only the eastern outskirts and the five miles beyond being entrusted to America, represented by the 3rd Division. But here, too, the Germans were forced back after a wavering fight; and on the morning of July 18, 1918, General Foch launched the victorious surprise attack on the 25-mile front from Chateau-Thierry north to Soissons.

Although these simple paragraphs cannot encompass the whole truth, it is hoped that they may remove some of the misconceptions that must inevitably prove harmful to American tradition.

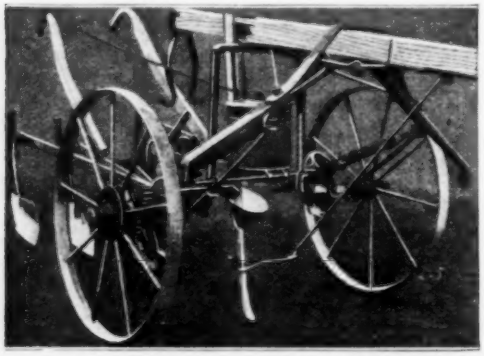
ACCUSTOMS NEW FLIERS TO AERIAL SENSATIONS



ALL the maneuvers and consequent sensations of expert flight are experienced within the walls of a room by the pilot of a new training machine for novice airmen. The nacelle of the counterfeit plane is hung in gimbals like a ship's compass, giving it free movement in every possible direction. As the student manipulates the correctly arranged controls, the machine carries him into loops, nose dives, tail spins, and every other evolution practiced in the navigation of space. The device, designed and built by a New York man, is now doing service in training young army officers at the Washington flying school. It strikingly illustrates the development in this class of machine since the appearance of the simple arrangement which formed the cover subject of Popular Mechanics only last September.

AUTOMATIC PLANTING DEVICE ATTACHES TO CULTIVATOR

Now the small farm is having its inning with labor-saving machinery. A Missouri farmer has invented a planting attachment for cultivators, in which the seed box is automatically operated by a gear on one of the wheels, dropping its seed into a planting nozzle in front of the cultivator blades. The planter is thrown into or out of action by a rod extending to the handles of the machine.



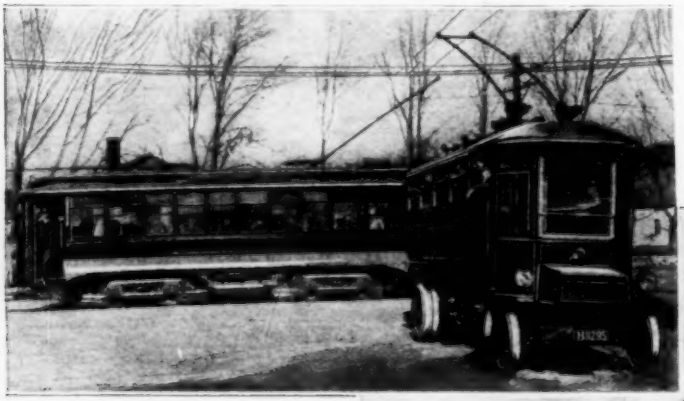
The Seed Box is Seen Fastened in the Center of the Cultivator; It is Operated by the Gears on the Wheel at the Left, Dropping Seeds into the Planting Spout Below

NAVY BUILDS MORE RADIO-COMPASS STATIONS

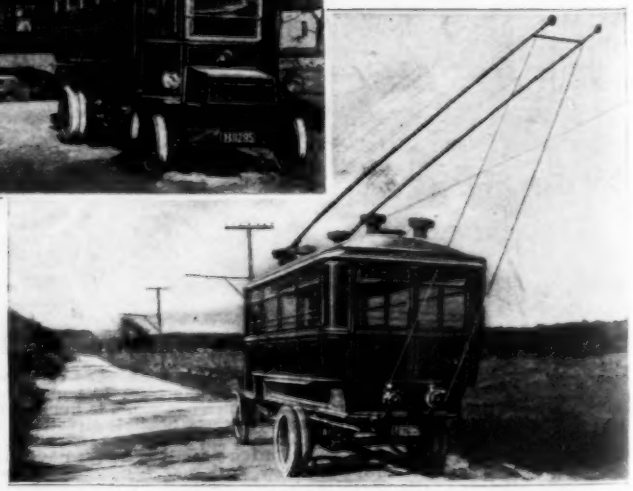
The radio compass, described in Popular Mechanics for January, 1912, has proved such a success on vessels of the United States Navy that 19 stations are soon to be established on the Pacific coast, in addition to the 33 now on the Atlantic and Gulf coasts. The new western stations will cover the entrances to Puget Sound, the Columbia River, Los Angeles, San Francisco, and San Diego.

TROLLEY CAR DRIVES TO CURB FOR PASSENGERS

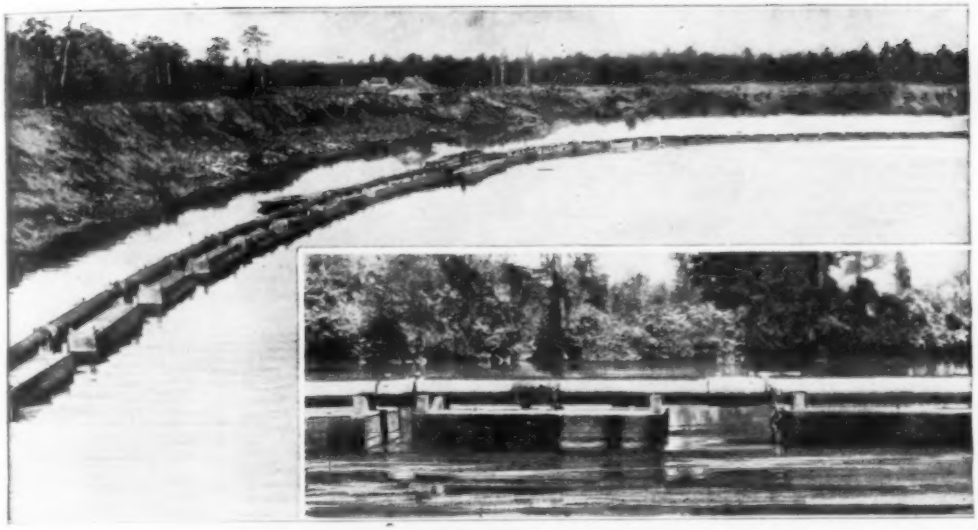
Several small New England towns have recently followed the lead of many foreign cities in adopting the trackless trolley. The American model resembles a long auto bus, travels on wide, solid-rubber tires, and is heated, lighted, and propelled by electricity supplied through two trolleys to an ordinary street-car motor. In cost of installation and operation, the trackless trolley is said to be much cheaper than its predecessor, as expensive rails, switches, and signals are all unnecessary. It is claimed to be more satisfactory in performance, also, as the swinging trolleys permit divergence to any part of a 25-ft. roadway, thus allowing the car to pass slower vehicles, avoid ruts, and even drive to the sidewalk to take on and discharge passengers.



As the Picture Suggests, the Trackless Trolley Car is Designed Primarily to Supplement the Service Provided by the Street Car



The Two Trolleys Are So Long That the Trackless Trolley Car can Travel on Either Side of an Ordinary Road, and Is Thus Able to Avoid Ruts and Pass Slower Vehicles



Some Idea may be Gained, from the Large View, of the Length of Floating Discharge Pipe Used in a Mississippi Dredging Operation, and the Number of Wood Pontoons Constructed for the Work. The Insert View Shows How the Pipe Sections were Connected by Rubber Sleeves

LONG DREDGE-DISCHARGE PIPE FLOATED ON WOOD PONTOONS

Overcoming extraordinary obstacles is the civil engineer's daily routine. In a Mississippi drainage job, a channel filled with stumps and logs, imbedded in stiff clay, was successfully cleared with a hydraulic dredge, aided by some blasting and crushing. The channel being too narrow for the usual steel pontoons, the long discharge pipe from the dredge was floated on quickly constructed pontoons of 2-in. pine, 13 ft. long, 7 ft. wide, and 2 ft. deep, carrying 16-ft. lengths of pipe. Rubber sleeves 2 to 3 ft. long connected the sections. This floating line to the spoil bank stretched out 300 or even 400 ft. as the dredger moved forward.

WORKMEN MAROONED HIGH IN AIR BY SALT STORM

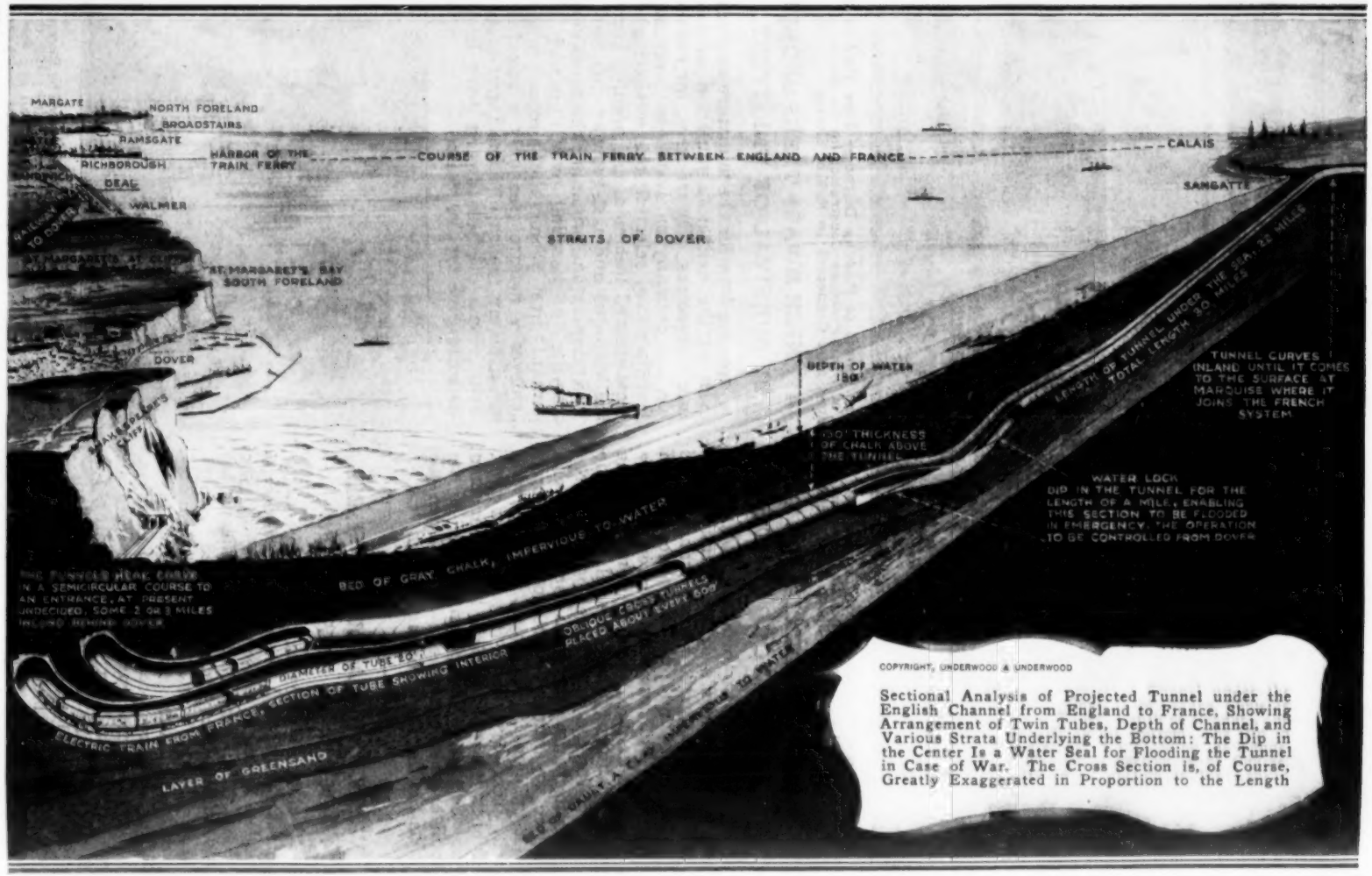
A violent windstorm recently swept across Great Salt Lake, and overland into Ogden, which it coated with a thin layer of salt. Buildings, pedestrians, sidewalks, and automobiles were all "salted" impartially. The only real damage done, however, was in the destruction of a 200-ft. scaffold around a concrete grain elevator. Six unfortunate workmen, who were on top of a finished part of the elevator, 100 ft. in the air, at the time of the collapse, were completely marooned until rescued with extension ladders by the local fire department.

JAPANESE DWARF TREES GROWN BY SURVIVAL OF UNFITTEST

Japanese love for the miniature extends even to the deliberate mutation of nature's processes. Dwarf trees, for example, are patiently cultivated by inverting Darwin's law, selecting the weakest and most stunted specimens and pruning away the vigorous and fast-growing members. By cramping and trimming the roots and starving the seedling over a period of perhaps five years, the proud owner achieves a mature tree only a few feet tall, a pigmy replica of some forest monarch. Some of these dwarfs have been known to live for 200 years.

COPYRIGHT, PRESS ILLUSTRATING SERVICE

Japanese Dwarf Trees, Patiently Cultivated by Reversing the Usual Process of Selection, Cutting Off the Vigorous Shoots, and Nursing the Small and Puny Ones: This Procedure is Continued for Several Years



COPYRIGHT, UNDERWOOD & UNDERWOOD

Sectional Analysis of Projected Tunnel under the English Channel from England to France, Showing Arrangement of Twin Tubes, Depth of Channel, and Various Strata Underlying the Bottom: The Dip in the Center Is a Water Seal for Flooding the Tunnel in Case of War. The Cross Section is, of Course, Greatly Exaggerated in Proportion to the Length

TUNNEL FOR ENGLISH CHANNEL REAL PROSPECT AT LAST

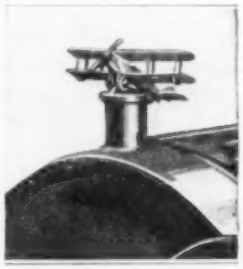
Plans for a tunnel under the English Channel, discussed so frequently during the last sixty-odd years, are now on the verge of materialization. It is announced that England and France are in perfect accord on the subject, and that war experiences have robbed its opponents of most of their contentions. From an engineering standpoint no serious difficulty is anticipated; through the impervious gray chalk underlying the channel bottom, electric drills will doubtess find easy and rapid passage. The plan calls for two 20-ft. tubes, side by side, connected at short intervals by cross openings. A drainage tunnel underneath disposes of seepage water. At the center of its length the tunnel dips to its lowest grade for one mile, constituting a water lock which could be flooded from the shore in case of military necessity. The total length from near Dover to a point between Calais and Boulogne, will be 30 miles, of which 22 will be 95 to 175 ft. below sea bottom. The channel's greatest depth over the proposed course is 180 ft. Estimates allow five years for completion, at a cost of $100,000,000. Electric trains will make the passage in 40 or 45 minutes, giving England direct access by rail to all parts of Europe.

AMERICAN BUYER BRINGS HOME PLATINUM WORTH MILLIONS

Packed in a specially constructed safe, a quantity of platinum totaling 23,000 oz., and worth $2,415,000 at the market price of $105 an ounce, was recently brought into this country. It traveled from Russia as the personal baggage of a Massachusetts business man, who had undertaken on his own responsibility to secure it for the government. To this task he gave over a year of his time without remuneration, advanced his own funds, overcame an uncounted number of dangers, obstacles and hardships, and sacrificed his health. The precious metal was obtained in many places, a few ounces at a time, the buyer carrying the accumulation with him. A tragic ending to the story of commercial romance is supplied by his death, four hours after his return, from exhaustion.

SMALL DE HAVILAND PLANE ADORNS RADIATOR CAP

Aluminum models of the De Haviland battle plane, with a wing spread of nine and one-fourth inches, are now made for desk use as a paper weight, or for attachment to radiator caps. The American insigne, in colors, on the wings and the propeller, which revolves on a moving automobile, give it quite a businesslike appearance. The little model is correct in all its essential proportions.



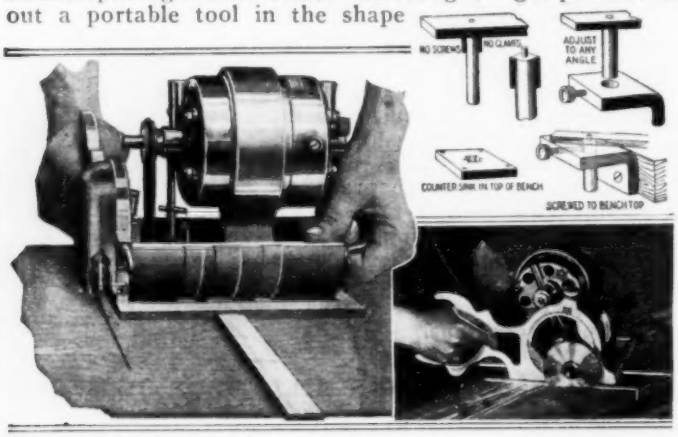
TEXAS HILLTOP CROWNED BY VICTORY COLUMN

Crowning a Texas hilltop stands a rude monument that speaks to travelers, for miles throughout the valley, of the people's gratitude for victory and their affection for the local men who sailed overseas. The ranchmen built the pedestal of rough stones, bound them together with cement, and surmounted the whole with a white cross. On every smooth-faced stone they inscribed the name of some allied statesman, general, flier, or victory, while on a tablet just beneath the cross they had engraved the names of the heroes from the valley. The unique monument rises 21 ft. above the hilltop.

Texas Ranchmen had Engraved on These Stones the Names of Heroes and Battles That Brought Victory to the Allies

WOODWORKING MADE EASY WITH ELECTRIC HANDSAW

Until lately a handsaw was one thing and a circular saw was another. But now an enterprising manufacturer has brought out a portable tool in the shape of a hand circular saw, with electric drive, that should make sawing wood a pleasure. A ¼-hp. universal motor is mounted directly on the tool, which has a handle like a regular handsaw and weighs only 12 lb. Two 3-in. saws are supplied, a rip and a crosscut, an eccentric mounting allowing adjustment for depth. The base, of aluminum, is grooved to slide on a track when a guide is necessary, such a track being part of the equipment. For ripping, the gauge slides along with the work. The saw blade is well guarded, so the tool is particularly adapted to manual-training school use. It operates from any lamp socket, direct or alternating current.



Light, Portable Circular Saw Operated Like a Handsaw: At Right, Guard is Removed to Show Eccentric Adjustment. Above are Shown Methods of Fastening Track to Workbench, So That Grooved Base of Saw may Guide It Accurately in Any Direction

BIG SHIPMENT OF EVERGREENS FOR DEPLETED FORESTS

One of the largest evergreen orders in the history of the nursery trade was recently shipped to a northern lumber company for reforestation of the concern's cut-over lands. The shipment consisted of 1,500,000 Norway spruce trees, enough to line a 280-mile road, as from Chicago to St. Louis, if planted only one foot apart. The nursery company kept a gang of more than 50 men at work on this order for two weeks, digging, counting, and packing.

ATLANTIC FLEET RACES NORTH IN SUCCESSFUL SPEED TEST

The Atlantic fleet recently concluded a most instructive season of battle and target practice at Guantanamo by racing up the Atlantic coast in record time. Every minute of the trip was used for maneuvers, and, north of Cape Hatteras, the weather proved so ideal that a most exacting speed trial was ordered. Starting at 17 knots, the armada was soon churning the foam at 19, then at 20.5, and finally at every ship's maximum speed. As a result, each one of the great vessels exceeded its record made in government acceptance tests, and the fleet steamed into New York harbor, behind the new superdreadnaught "Mississippi," just 20 hours ahead of schedule. New York was surprised, but Riverside Drive was soon crowded with those anxious to see the most imposing marine spectacle ever staged in American waters, consisting of 12 "all big gun" fighters, more than 60 destroyers, 10 new submarines, and a whole division of auxiliaries.

RUBBER "MUSCLES" ENABLE WOOD DOLL TO WALK

By using the resiliency of rubber bands as a substitute for muscular action, a New York inventor makes a wooden doll that will actually walk. Of course it will not stroll away by itself, but when led by the arm and swayed gently from side to side, it gives a very fair imitation of a promenade. Handled with an acquired knack, it readily bows and even executes a few terpsichorean steps. The large size of the figure adds to the illusion of life, and at a short distance it appears to be stepping along very well for one so young.

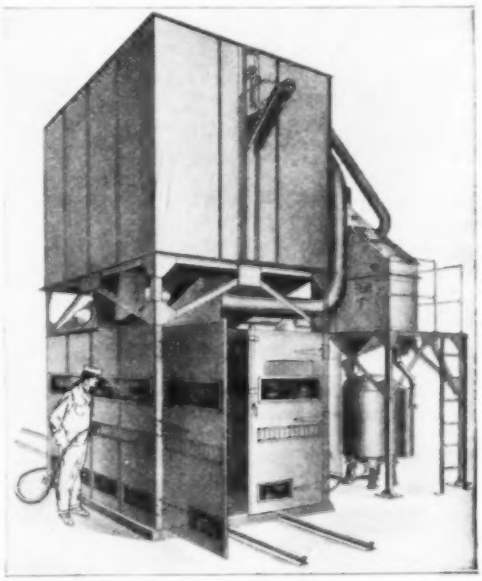
This Tank Set Out for the Summit of Pikes Peak to Advertise the Victory Loan. At the Left It is Seen Skirting One of the Drifts That Blocked the Ascent. It would Probably have Reached the Top but for an Unexpected Change in the Schedule

WAR TANK TRIES TRIP UP PIKES PEAK

The "Little Zeb" is one of the several tanks that toured the western states in the interest of the Victory loan; but it is the only one that tried to climb Pikes Peak. It courageously chose an unfavorable time of year, too, when the winding mountain road was blocked by snowdrifts that sometimes rose in its path to a height of 10 feet. It waddled along finely behind its motto "Pikes Peak or Bust," however, until twelve miles up the slope something did "bust." Repairs were made, despite a 60-mile gale, near-zero weather, and a cracker-and-sardine diet for the crew. Then the "Little Zeb" started again, only to be stopped, still short of the summit, and ordered elsewhere by a messenger from headquarters.

STEEL ROOM SECURES SAFETY FOR SAND-BLAST OPERATOR

For cleaning large castings with a sand blast the use of a steel room has been found to result in increased safety and convenience for the operator. He wheels the casting into the room on the house tracks, closes the steel doors, and directs the sand blast upon the casting through a multiple-section curtain which permits movement of the nozzle in all directions. He is able to watch his work, meanwhile, through a wire-protected curtain at the height of his eyes. Spent abrasive, core sand, and refuse fall through the grated floor, and are carried by a conveyor to a separator which delivers waste material to a refuse bin, and the abrasive sand, sharp and clean, to a storage bin for reuse. Through the inlet screens along the bottom and a ceiling hood at the top a powerful draft is maintained, keeping the room free from dust.

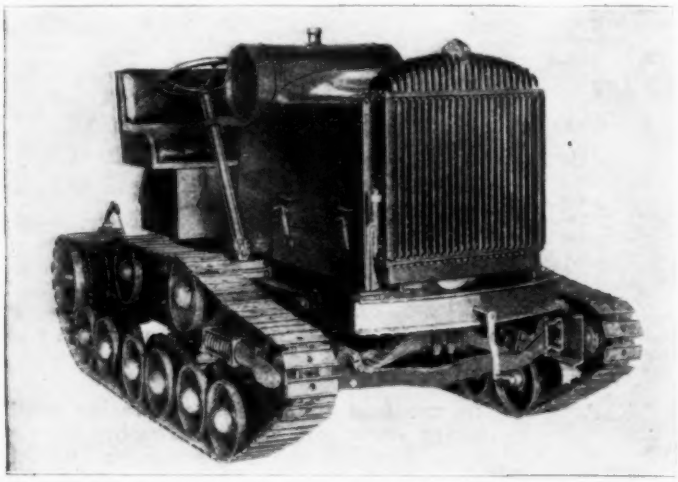


The Sand-Blast Operator is Entirely Protected from Choking Dust and Flying Particles by This Steel Room

War-time restrictions on the use of radio receiving stations, other than those used for commercial traffic, have been removed. The restrictions on transmitting stations remain in effect.

TRACTOR BUILT LIKE A TRUCK HAS PRESSED-STEEL TREADS

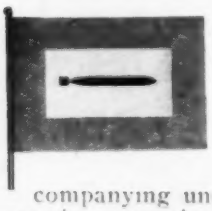
Except for its more compact form, a type of farm tractor recently designed follows the conventional lines of motor-truck construction. Experimental work performed by the inventor while in the Ordnance Department of the army is declared to have suggested the departures from usual tractor practice. The endless tread is made entirely of pressed steel, assuring strength and lightness.



Motor-Truck Construction Is the Characteristic of This Three-Plow Farm Tractor, the Only Important Difference being the Running Gear, Which Is the Endless-Tread Type, Made of Pressed Steel

NEW WARNING FLAG FOR SHIPS ACCOMPANYING SUBMARINES

A conventionalized torpedo in black, on a white field with a wide red border, is the design of the navy's new warning flag. It warns, however, of the presence of our own subs and not an enemy's. All tenders, launches, and other craft accompanying underwater boats in their practice operations, fly it to keep commercial shipping out of danger.



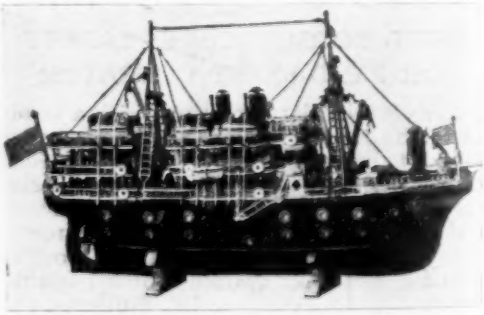
¶ Gas masks of the type approved by the government are reported to have failed when two members of a large city fire department penetrated a cold-storage room filled with fumes from a broken ammonia pipe.

IRELAND-AMERICA RADIO TALK MAY EVOLVE WORLD SYSTEM

Early establishment of commercial radiotelephone stations for transatlantic messages is promised as a result of successful transmission from Ireland to Cape Breton Island, Nova Scotia, a little more than 2,000 miles. While this breaks no distance records, the reliability of wireless-telephone equipment has been greatly improved since the 4,800-mile conveyance of speech from Arlington, Va., to Pearl Harbor, Hawaii, in September, 1915. A recently developed form of vacuum-tube valve was used in the Ireland-Nova Scotia test, but further details of the equipment are not disclosed. Photographs purporting to show the new receiving apparatus have appeared in the popular press, but prove to be views of apparatus used in 1915. No new photographs have yet been released.

PRESIDENT GIVEN FRUIT OF TWO YEARS' TOIL

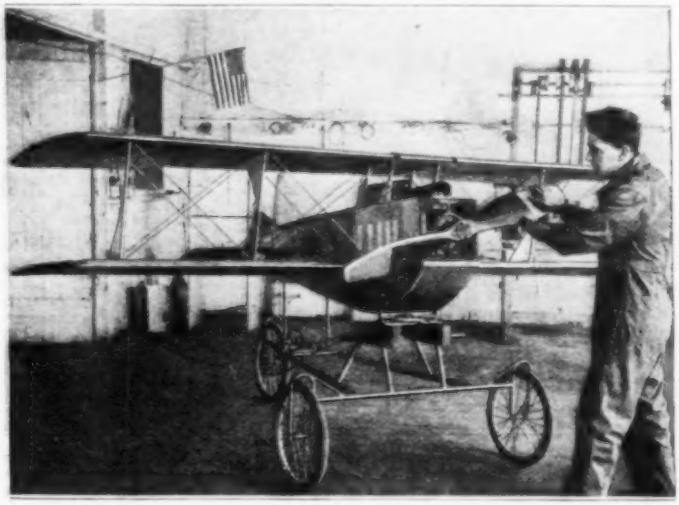
When a Greek miner completed a miniature ocean liner after two years' labor, he promptly christened it "The Agent of Democracy" and sent it to President Wilson. With knowledge gained from service in the Greek navy, he was able to include every important detail found on large vessels.



This Model Steamship Is Only 28 Inches Long, Yet It Possesses Every Important Detail of an Ocean-Going Vessel

PILOTLESS TORPEDO PLANE IS FLYING DESTROYER

A pilotless airplane, charged with 50 lb. of the dread T. N. T., and adjustable with uncanny accuracy to explode at any point within 400 miles, is one of the spectacular weapons whose use by the American army was forestalled by the armistice. The device, which is literally a complete small biplane, was invented by a Los Angeles man, and had already received the attention of government experts. The machine flies without its ground wheels and chassis, which are disengaged, as the body rises, by the action of a governor releasing a spring. About a 300-ft. run is needed after starting the engine, before the plane attains a speed of 40 miles an hour and soars away. In its flight it reaches an altitude of about 3,000 ft. The rear half of the body is a bomb, which may be set to explode at any desired distance. How the machine is guided so accurately to its calculated destination is not divulged. But at the determined point, a trigger is released; instantly the power of the engine throws the wings clear off the machine. The body, engine and all, drops, nose first, like a plummet, the engine and its parts adding to the occasion by serving as shrapnel when the burst occurs. The tail guides the downward flight, but explosion follows on landing in any position. A flight of 100 miles resulted in accuracy of burst within 50 yd. in government tests. Acting practically as an ultra-long-range gun without a barrel, the cost of a shot with the flying projectile is declared to be comparatively low.



The Self-Propelled Bomb-Plane as Seen Here Is Ready for a Start. The Chain Gearing Observed at the Rear of the Chassis Operates a Governor, Which Disconnects the Plane's Body from the Running Gear When the Speed Is Sufficient for Flight. The Details of Adjustment Which Assure Such Extraordinary Accuracy in the Explosive "Landing," Caused by Detaching the Wings from the Body at a Predetermined Distance, are Not Disclosed

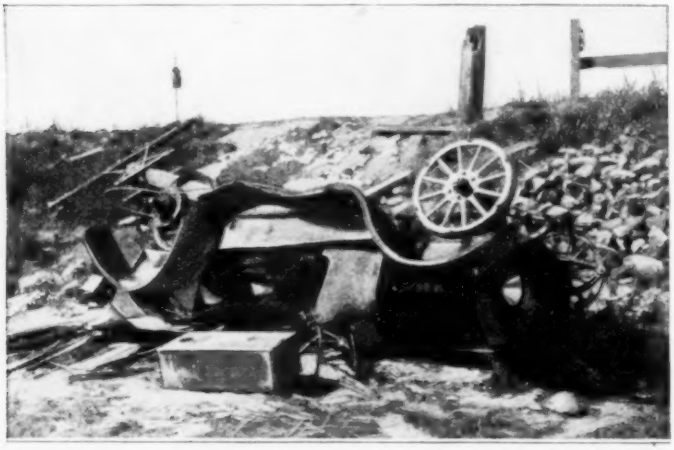
This Is the Bomb into Which the Plane is Changed When It Throws Off Its Wings, and the Loaded Body and Engine Drop to the Ground

---

¶ The attorney-general of the United States has been requested by the secretary of war to begin condemnation proceedings for government acquisition of Cape Cod Canal. The private owners of this convenient water connection with Boston and other New England points refused an offer of $8,250,000 made by the war department.

FAILURE TO DIM HEADLIGHTS CAUSES BAD AUTO WRECK

All who have driven along dark roads at night know the sense of apprehension kindled by the glaring headlights of an opposing car. Recently an army officer, driving a brand-new car along a California road, blinded by approaching lights, turned too far out and crashed into a 4 by 4-in. fence post. The car turned completely around, cutting off a 12-in. telephone pole, rolled, upside down, into a deep ditch, and then burned up. The driver and his fellow officer were seriously, but by good fortune not fatally, injured. To dim headlights in meeting other cars is required by law in many states.



Glaring Headlights on Another Car Were Directly Responsible for This Accident, the Blinded Driver Turning Out Too Far and Striking a Fence Post. A Telephone Pole Broken by the Crash is Seen Lying on the Bank

YALE UNIVERSITY DROPS LATIN REQUIREMENT

Recent changes of policy voted by the corporation of Yale University are typical of the new educational attitude. The reorganized college will demand Latin as a graduation requirement only from those students who wish the B. A. degree. To those with no Latin will be awarded the degree of Ph. B., hitherto granted by the Sheffield Scientific School, whose graduates will now be Bachelors of Science. The college will require of every student in every course, however, a sound knowledge of American history and government. Further, it will grant its professors a substantial increase in salary, insuring a higher grade of instruction to the students and a more comfortable living to teachers and families.

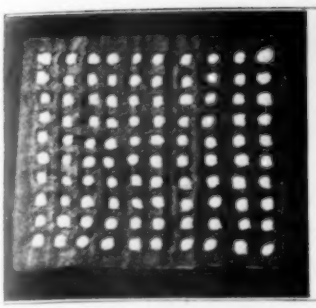
ARMY SURGEON DESCRIBES LESSONS TAUGHT BY WAR

Among the lessons learned from wartime surgical experience an American Army authority chooses two as of outstanding importance. The first is the change from the harsh antiseptic methods of the war's first years to mild aseptic treatment. Surgeons have found that well-nourished tissue withstands infection, and even expels it, without external aid. In consequence, they simply clean the wound of foreign matter and devitalized tissue, and close it immediately without the use of an antiseptic. The second lesson learned is that shock is caused by deficient oxidation of the red corpuscles. Hence, to avoid this shock, so often fatal in major operations, nitrous oxide combined with oxygen has been widely used as an anesthetic.

ANTICLOGGING GARDEN PLOW HAS TWO HINGED SHOVELS

Cultivators or garden plows of the three-shovel kind are kept from clogging by an Iowa inventor's simple arrangement. The two outer shovels are mounted on hinged beams, so that either one or both may be swung up out of action. They are held in normal position by large washers and wing nuts on the center beam, which is stationary. Each washer is cut away on one side, and when turned permits the beam to swing past it. Turned back, it holds the beam suspended.

The Implement at the Left Becomes a One-Shovel Cultivator by the Lifting of Its Two Outer Blades on Their Hinges. The One at the Right is Working with Two Blades, One being Temporarily Held Up



In the Seed-Corn Tray at the Left, the Kernels are Laid in Compartments in Damp Sawdust. At the Right is Seen a Corner of a Seed-Testing Station, the Electric Testing Cabinet Being at the Extreme Right. The Boy is Cording the Ears to Save Racks

DAKOTA FARMERS SAVE CORN WITH ELECTRIC TESTER

Farmers in one county of South Dakota raised a fine crop of corn from very poor seed, and saved about $15,000, just because the director of the county farm bureau installed an electric seed tester. This device consists of a water-jacketed metal cabinet, with a heating element in the bottom and a thermostat in the top. Its two compartments each contain 18 wire-screen trays, holding the samples of seed, either folded in canton flannel, or, for single-ear tests, inclosed in holes punched in a blanket pad. Trays of moistened sawdust are also used. With its constant standard of heat, moisture, and air supply, the tester assures a reliable indication of germination.

CARPENTERS' FOLDING SQUARE HAS MANY USES

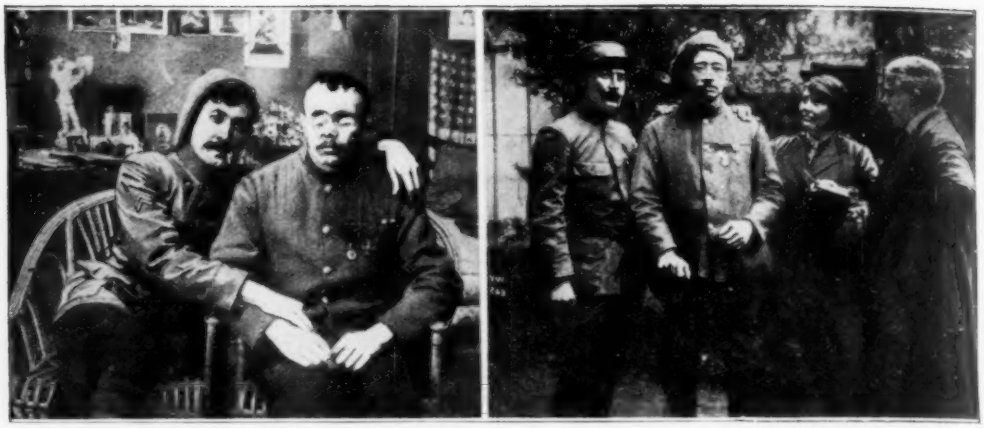
By hinging the ordinary carpenters' steel square, and providing a third strip, calibrated in inches and degrees, to connect the two arms, a folding square has been obtained that may be put to many uses. It may be clamped to lay off anything from a straight to a right angle; it will divide any angle as desired, or it may even be extended, clamped, and used as a yardstick. Besides making several instruments superfluous, the tool will fold into the carpenter's tool box, unlike the cumbersome rigid square.

SURGEON USES SAME IODINE MANY TIMES

Iodine is now recovered from the hundreds of gauze and cotton "mops" used daily in the surgical wards of a large army hospital. Instead of throwing them away, as formerly, they are heated in the apparatus illustrated. Alcohol evaporates and condenses in the cooled upper tube, then falls back through the mops, carrying the iodine down with it to the bottom of the flask in the form of a tincture. The mops are saved, too, by subsequent washing and sterilizing.

HANDLE BRAZED TO FRAME PLEASES MOTORCYCLISTS

A body of motorcycle policemen decided that the repeated effort of lifting their 350-lb. motorcycles on and off the stand many times a day was too fatiguing. So the mechanic in charge devised a handle which he brazed to the frames in the most convenient position, greatly reducing the effort needed each time the heavy machine is lifted.



PHOTOS BY COURTESY OF THE Y. W. C. A.

This Blind French Soldier is Waiting, as We See Him at the Left, for the New Mask and Artificial Eyes Which Restore to Him the Normal Appearance of the Right-Hand Picture

WOMAN MODELS HAND-PAINTED COPPER FACES FOR MUTILATED SOLDIERS

By GRACE GOULDER

With the Y. W. C. A. in France

Leaves of ivy dance over the high, old stone walls of the courtyard in front of her house and you have to climb five flights of winding wooden stairs to get to her studio. And when you get there, you are sure to find a half dozen French soldiers sitting around chatting or drinking tea. One or two of them will have bandages over their faces, or horrible face mutilations. But the others will seem perfectly sound and whole.

When Mrs. Ladd—Mrs. Anna Coleman Ladd she is—comes forward to greet you, she will probably be carrying what looks for all the world like a human nose, or part of a man's cheek, or maybe it will be an ear. And she handles it quite unconcernedly as she goes on talking with you. For in the time she has been in Paris she has made parts of faces for 71 mutilated soldiers.

This View of a Corner of Mrs. Ladd's Studio Shows Some of the Many Models She Uses in Her Humane Undertaking. The Masks, of Thin Copper, She Makes from Casts of the Mutilated Features

She tells you to look at the man in the corner—the one passing cakes to his companions. You observe a rather handsome black-haired boy, with a decoration pinned on his blue soldier's blouse. And Mrs. Ladd tells you that his nose and mustache, as well as part of his cheek, are artificial. He will take the mask off if you want him to, she announces, but you beg to be excused from witnessing it.

"Oh, they are just as proud as they can be of their new faces. All these men would show you their masks in a minute and be glad to," she will tell you. "This one standing near the modeling board has no chin at all. He was wounded early in the war and he was very much discouraged about life. But now he is going to be married and the future looks bright. Of course, he has to lift his mask every little while to wipe away the saliva, and he cannot talk well or eat solid food or smoke—but he feels that he can mix with people once more.

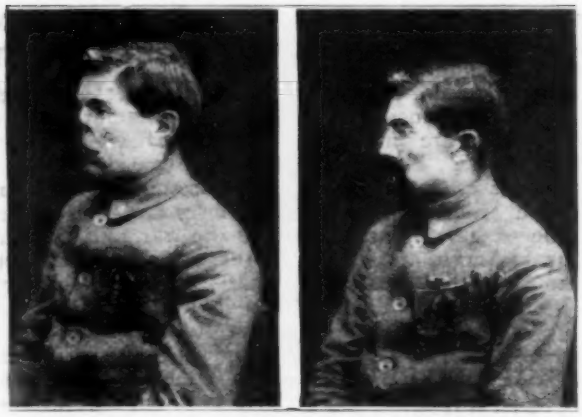
"So far, I have had only five American boys. I cannot make masks until the wound is entirely well and that takes some

time. Also, I never get the cases until the surgeons are sure they can do nothing for them. And so, the Americans have not started to come to me in any great numbers.

"But every one of those who come has been so sensitive and dispirited. The French are different about it. They have become used to horrible wounds in the four years of this war—used to their own and those of their friends. But these American soldiers saw nothing ahead. They wouldn't believe my masks would make them as good as new. You don't know what a satisfaction it is to fit them out and see their pleasure and surprise. They seemed to take hold all over again as they looked at their changed faces."

Mrs. Ladd was a sculptor in Boston before she took up this work for the Red Cross. She first models the maimed face. Then she makes a cast of the face as it was before the wound. Most frequently she does this from a photograph. When the soldier has none, she studies what is left of his face and models the missing features to suit the rest. The mask itself is made of thin copper. This is afterward tinted with the most delicate of water coloring, a process requiring the most exact and careful work because the mask must match perfectly the skin of the face. These artificial face parts are usually held in place by means of a string matching the color of the hair and worn over the back of the head.

Some of the men have had frightful eye mutilations. Mrs. Ladd has fashioned new eyes for them. Her mustaches and whiskers are guaranteed to last. They can be pulled and twirled, a fact appreciated by the Frenchman. Indeed, there is no part of the human face Mrs. Ladd has not supplied.



Here We See, First, an Example of War Mutilation, All Too Common a Sight in France These Days; and Second, Its Restoration by False Nose, Made of Thin Copper and Tinted Carefully by Hand, and a Mustache

Another Instance Where an Artificial Nose, Provided for a Mutilated French Soldier, Brought Back Not Only Appearance, but Confidence and Morale to Its Wearer, Thereby Making Him a Better Citizen and Certainly a Happier Man

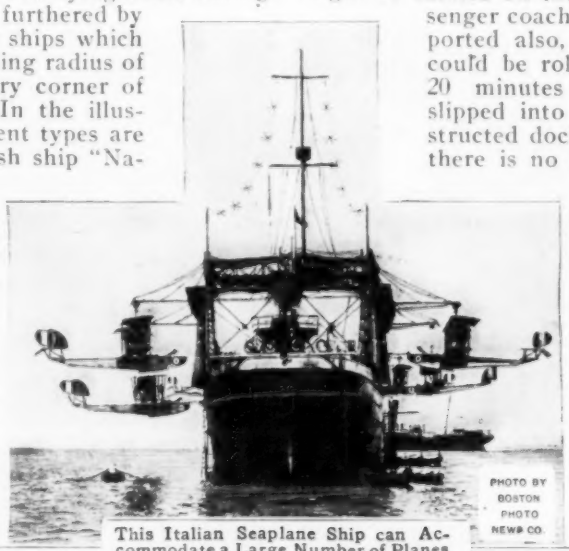
This Soldier had His Chin Shot Away with an Effect on His Appearance Which May be Realized by a Glance at the Left Picture; but with a Copper Substitute, and a New Mustache, the Injury Is Not Perceptible

Hanging in gruesome rows along the walls of her studio are dozens of plaster casts of mutilated faces and of corresponding normal faces. Some of them are twisted and smashed into almost unrecognizable masses. Mouths are pulled in hideous fashion under ears. Noses and chins are swept off faces entirely.

A touching versified tribute was paid the sculptress by one of her French patients, who ends by saying that he and his fellow sufferers "through years to come shall never forget her kind ministrations."

SEAPLANE SHIPS DIFFER IN CONSTRUCTION

The invaluable patrol and convoy work accomplished by allied flying boats during the war was often furthered by the use of mother ships which extended the cruising radius of the planes to every corner of the seven seas. In the illustration two different types are shown. The British ship "Navanna" picks up her charges at the stern, from which they are carried into the hangar, where they are completely protected from sun and rain. On the Italian "Europa," however, the planes are slung along the sides.



This Italian Seaplane Ship can Accommodate a Large Number of Planes along the Sides. They are Slung from Booms, and may be Quickly Lowered into the Water

PROPOSED CHANNEL FERRY WOULD CARRY 300 CARS

For centuries suggestions have been offered for facilitating the cross-channel commerce of England and France. The tunnel from Dover to the French coast has fascinated most imaginations; but a car ferry has been in actual operation during the war, and its extended use in peace is urged by many advocates, who declare that it needs no better demonstration of its value than has been given. One of the best informed of these has made definite proposals, suggesting the construction of two 25,000-ton ferries that could make the trip in about 90 minutes. He would have the boats 600 ft. long, with a draft of 29½ ft., and arranged so that 300 freight cars might be carried on the two decks. Passenger coaches would be transported also, which he figures could be rolling on their way 20 minutes after the ferry slipped into its specially constructed dock. Unfortunately, there is no French port near Dover with harbor deep enough for boats of such heavy draft, but it is explained that Boulogne harbor could be dredged, or a new port could be constructed at a cost of approximately $15,000,000, and requiring about four years' work.

This British Ship Is of Different Design. Only a Few Planes can be Sheltered in the Hangar at the Stern, but They are Completely Protected from the Weather, and can be Transported in the Roughest Seas. Vessels of This Sort Were Invaluable in Extending the Cruising Radius of Sub-Hunting Flying Boats

The Whole Equipment of the Venice, California, Aerial Police is Assembled in This Picture—Three Planes, Lettered with the Police Designations, and a Station House. The Small but Speedy "Black Maria" is Seen at the Extreme Right

Venice Aerial Police Station No. 1 Is the Close-Up at the Left. The Right-Hand View Shows the Mayor of Venice Swearing in the First Aerial Policeman, Who Is Proprietor of a School for Fliers, and His 80-Horsepower Patrol Plane

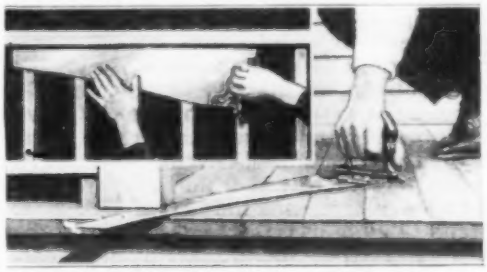
FIRST AERIAL POLICE FORCE APPOINTED IN CALIFORNIA

Traveling its ethereal beat over the city of Venice, Calif., is the world's first airplane police force. Venice Aerial Police Station No. 1 is open, and three patrol planes are ready for terrestrial law breakers. A speedy biplane, the "Black Maria," and two 80-hp., 90-mile an hour, passenger-carrying planes constitute present equipment, which will be increased when occasion demands. On the body and under the wings of each plane are the police designations in yellow letters. Speed violations and surf accidents are the special assignments of the fliers.

¶ Across 11 miles of rough country near Pittsburgh, Pa., is being constructed what is probably the largest gas line in the world. It will have a maximum diameter of 40 in., enabling it to convey 70,000,000 cu. ft. of gas daily from a by-product coke plant to three steel mills.

HINGE IN SAW HANDLE SAVES KNUCKLES

Operating a handsaw, with the blade flush against a wall or other flat surface, has meant scraped knuckles as long as saws have been used. One carpenter has finally decided to conserve knuckles and



The Common Annoyance Caused by Attempts to Saw as in the Illustration is Removed by the Adjustable Hinged Handle

temper, however, by hinging the handle. An adjusting screw holds it in any position relative to the blade.

RUBBER FROM RABBIT BRUSH

By J. CECIL ALTER

THE common rabbit brush *(Bigelovia)*, growing natively in practically all arid western states, where it occupies an area next in extent to that covered by sagebrush and shadscale, has hitherto been considered valueless except as an indicator of moist subsoils, and a source of a certain amount of winter forage for cattle. However, recent experiments by H. M. Hall, professor of botany, University of California, and his special assistant for Utah, Prof. Marcus E. Jones, have discovered it to be a certain container and producer, and a probable commercial source, of fine rubber, only slightly inferior to pure Para rubber.

The investigation so far reported is only a preliminary quantitative examination, begun quietly some months ago as a war measure, but continued to prevent vitiating valuable information partly developed. It has not yet been announced to be commercially profitable, though in Utah alone there is said to be between 500 and 1,000 square miles of the brush, and a great deal more land that could be made to grow the plant. Tests reported by Professor Hall show from 5 per cent to 10 per cent rubber, by weight, of the entire plant, excluding the finer roots and stems, though Professor Jones believes, from his own determinations of rubber content, that 10 per cent is extremely high, probably two or three per cent being nearer the average yield from a well-developed plant.

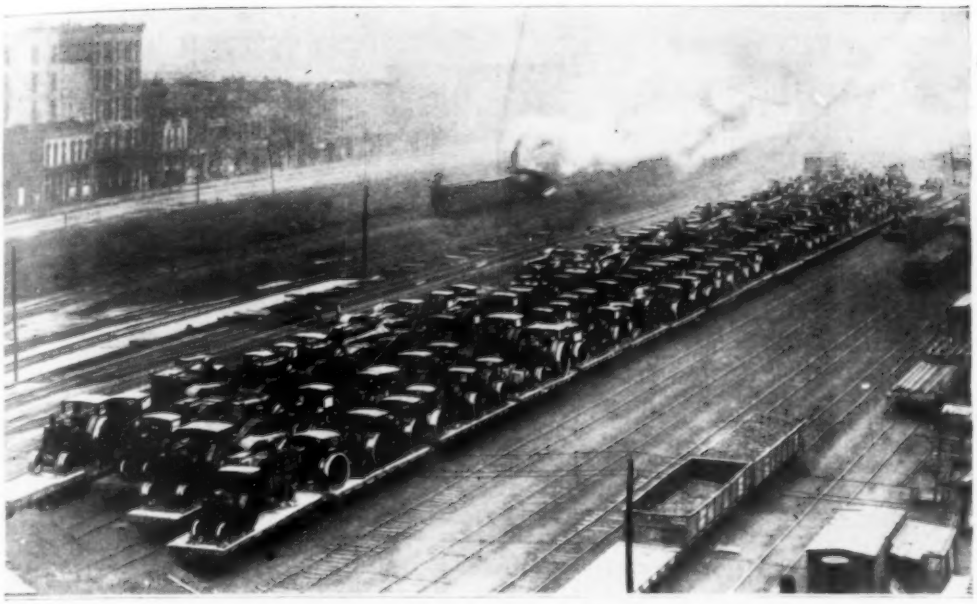
Natively there are from 1,000 to 4,000 plants per acre, weighing from .1 to 2 lb. each, though it is estimated by the investigators that about 3,000 plants, averaging 3 ft. high and weighing around 3 lb. each, can be grown on an acre, which, at a fair calculation based on tests made, would yield around 250 or 300 lb. of rubber. Plants have been found 10 ft. high and 4 in. in diameter at the bole. If grown artificially by planting and cultivation, without irrigation, in average Utah weather conditions, a harvest could be taken every four or five years, at a light expense for seeding and harvesting. Under irrigation the yield could probably be increased fourfold, it is estimated. The quantity of rubber in the plant seems to vary directly with the amount of alkali in the soil, up to a certain limit; thus the less value the soil is for agricultural purposes, the more valuable for producing rubber. The greatest quantity of rubber is found in the plant in winter, hence this would become the harvest season. The rubber is dissolved out through the pores in the wood, or, after macerating, with the ordinary benzine solvents of rubber.

Thousands of Acres in Western States are Covered with This Rabbit Brush, Hitherto Considered Practically Valueless, But Now Declared a Probable Commercial Source of Fine Rubber

CLINKERS BROKEN WITH WATER JET

A stream of water is used successfully to remove the clinkers which are caught between the grate and bridge wall, in the boiler equipment of an electric company in a central state. Burning local grades of soft coal, handled with an underfeed stoker, occasional clinkers are formed too large to pass the opening to the ash hopper. When this happens a fireman directs a stream of water upon the clinker through the side door. Only a minute is required to cut or break up the fused mass, which parts readily before the jet. The rapid evaporation of the water prevents damage to any part of the furnace.

¶ The opulent ex-doughboy, who has now donned civilian clothes and is living on the income from his army pay, may be interested in diminutive gold and silver service chevrons now being displayed by the jewelers for wear on the coat lapel.



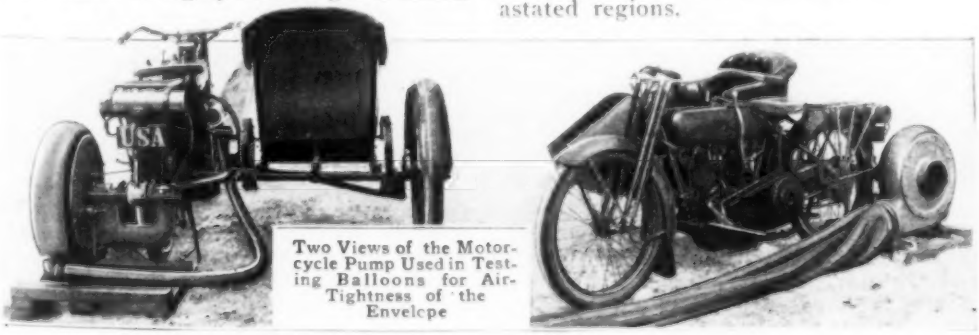
HUGE TRACTOR AND SEPARATOR SHIPMENT BREAKS RECORDS

DURING a middle-western tractor show one company exhibited in the city freight yards a $250,000 shipment of tractors and small grain separators. The shipment was made from a single factory to dealers in three western states on two trains of 40 cars each, and is believed to establish a new record in size. It certainly illustrates the increasing popularity of motor equipment for the farm.

MOTORCYCLE USED IN TESTS OF ARMY BALLOONS

For trial inflation of army balloons several schools are finding small, portable motorcycle outfits a great convenience. The rotary air pump is transported in the sidecar, and, in operation, is simply placed behind the motorcycle with its small friction drum in contact with the rear wheel. Running at 25 miles an hour, the machine will fill a balloon of 35,000-cu.-ft. capacity in 30 minutes, consuming only one quart of gasoline. No difficulty has been experienced from overheating, even after six consecutive testings, as a second, smaller air hose is led directly to the cylinder walls. A highly colored gas is mixed with the air in the sleeve to render visible any leaks in the envelope. Although simple and economical, the appliance's greatest merit is its portability. It is the work of but an instant to load the pump into the sidecar and hasten to any part of the field.

¶ Accompanied by a government expert, a herd of 104 American dairy cattle recently boarded its own special transport at New York, bound for Havre, France. The cattle were purchased by France to bring health to the children of her devastated regions.



Two Views of the Motorcycle Pump Used in Testing Balloons for Air-Tightness of the Envelope

DISINFECTING SHOWER BATH GIVEN THEATER AUDIENCE

Special authority had to be secured from the authorities at Rome when it was desired to hold a large Italian-American celebration during the "flu" epidemic. Permission was obtained, however. The audience of 4,000 persons assembled in the theater at the appointed day, and conversation buzzed before the curtain rose. But not for long. Ushers stepped into the aisles bearing monster syringes, bowed with Latin courtesy, and squirted a cloud of disinfectant down the row of seats until it mingled with the cloud from the next aisle.

An Italian Audience was Surprised during the Influenza Epidemic When Ushers Produced Huge Syringes with Which They Solemnly Sprayed Everyone. The Disinfectant Stung a Bit, but was Rather Pleasantly Perfumed

JARLESS ELASTIC SHUTTLE PREVENTS BREAKAGE

By eliminating the spring between spindle and sleeve, and substituting instead an accessible spring which fits in the notches of a flanged adjusting collar, the inventor of a new shuttle is said to secure greater convenience and efficiency. The shuttle is made elastic longitudinally, thus preventing breakage of the thread and parts due to jars at the ends of the shuttle traverse.

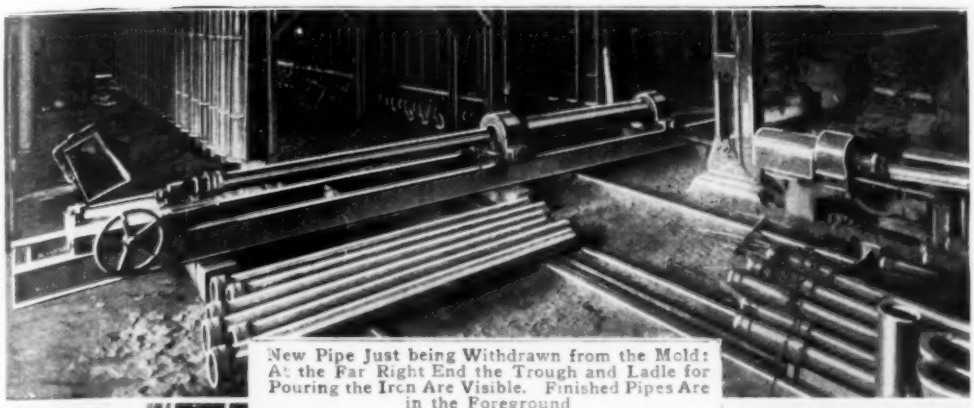
COOPERATIVE TRUCK LINE OPERATED BY FARMERS

The unusual success of a rural coöperative experiment in Maryland has led the Department of Agriculture to suggest similar enterprises in other agricultural sections. The farmers in this venture, who all live about 25 miles from their consuming center, decided a few years ago that the time, expense, and manner of shipping their produce to market, and of securing supplies from the city, were all unsatisfactory. So ten of their number secured from the state a charter for a "Farmers' Coöperative Company," intended primarily for transportation of farm produce, but enabled by the liberal terms of the charter to engage in almost any business.

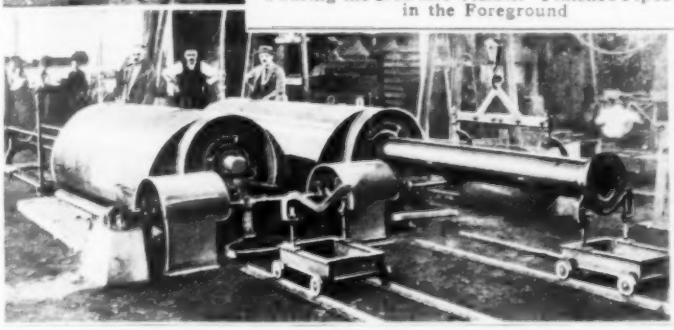
The company was capitalized by the sale of 200 shares of stock at $25 each, making it possible to buy a four-ton truck, hire an operator, and start the service. As most members live along the main highway, they found it convenient to place their produce on small roadside platforms, from which collection was easy. And with low rates and quick service the business grew, another truck was bought, and a small receiving warehouse rented in the city.

Coöperation in this field proving so successful, the company has tried coöperative buying and selling. Members notify the secretary of their needs, he groups them, and buys in the city at wholesale rates. Good results in selling have been effected, too; as in the case of the company's eggs, which reach the city in such fresh condition that the price is considerably increased. It must be remarked that no attempt is made to deal directly with the consumer.

The government warns that a venture of this kind should be started only after a thorough survey and analysis of the local situation. If, then, it seems well to proceed, careful thought must be given to the amount of capital stock advisable, to the election of able directors, to the purchase of efficient trucks, and to the choice of expert, conscientious operators.



New Pipe Just being Withdrawn from the Mold: At the Far Right End the Trough and Ladle for Pouring the Iron Are Visible. Finished Pipes Are in the Foreground



A Closer View of the Rotating Molds is Obtained in the Left-Hand Picture, Which Also Indicates the Method of Withdrawing the Pipe. The Typical Cross Section of Pipe Made by This Process, Seen at the Right, Reveals a Remarkable Thinness and Uniformity of Walls

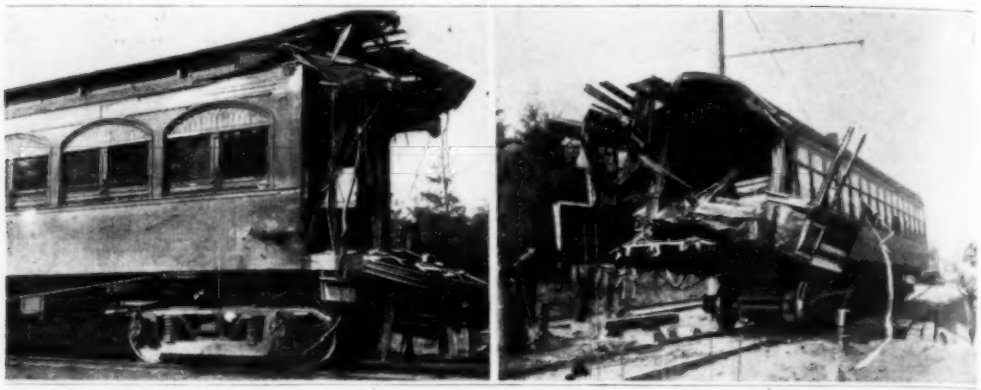
IRON PIPE CAST AND COOLED IN CENTRIFUGAL MOLDS

A curious method of casting iron pipe, devised by a Brazilian engineer, has proven quite successful and is being commercially undertaken in this country and Canada. A rotary, water-cooled cylindrical mold receives the molten metal, no sand being used. The iron, at very high temperature, is poured through a funnel into a trough, which is immediately introduced into the revolving mold and turned over. Centrifugal force distributes the metal evenly, and as graduated ladles are used, there is no waste. The finished pipe is withdrawn a few seconds after the iron is poured, coming out lengthwise quite easily. The walls of pipe so cast are remarkably thin and uniform, and tests indicate greater strength and closer texture than result from ordinary casting in sand. Many experiments in centrifugal casting of iron pipe have previously been tried, but did not prove commercially practical. The success of this system is attributed to the cold mold and the instant withdrawal of the pipe, which hardens as soon as poured.

PUSHCART NOT FORGOTTEN IN PROSPERITY

A business man who is proud of his humble beginning has placed a pushcart in the cupola which surmounts his three-story building. Behind the pushcart he started on the journey which led to his success; so, when this structure was built, he included the cupola in the specifications.

The Owner of This Building Still Keeps the Pushcart with Which He Got His Start; He Built This Cupola for It



The Wood Coach at the Left is Seen to be Only Slightly Damaged, While the Steel Car in the Right-Hand Picture was Crushed for a Third of Its Length, and Its Forward Trucks were Driven Back to the Center

FALLING TRUCK CAUGHT BY PIPE LINE

When the big auto truck in the illustration skidded on a slippery road, and headed for a deep gully, the driver felt his reckoning was at hand. But a friendly oil pipe intervened and checked the descent. No one was hurt and neither machine nor pipe line seriously damaged.

No One was Hurt and No Damage Done to Truck or Pipe Line in This Accident

¶ Lima, Peru, has contracted with a New York firm for a $750,000 hotel to be owned by the city and operated by Americans.

WOOD CAR RESISTS COLLISION WHILE STEEL CAR CRUMPLES

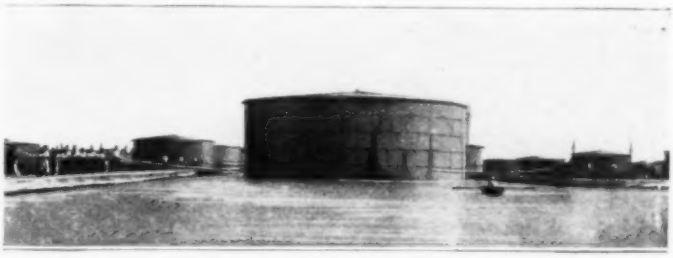
Some shadow of doubt was thrown upon the boasted invulnerability of the steel railway coach by a recent accident north of Seattle, Wash. An electric interurban car of steel and one of wood, met, head-on, at high speed. The front end of the steel car was utterly demolished, the crumpled metal injuring a number of passengers. The forward trucks were forced back to the center of the car. The wood car lost its front vestibule, but few of its occupants were hurt, and it resisted the shock so well that it was able to leave the scene on its own power, while a derrick was needed to remove the steel coach. The verdict of engineers, as reported by a correspondent, is that with two steel cars, the body of one would have been swept from its deck, with disastrous results to the passengers; while with two wood cars, absorption of the shock by the laminated deck beams would have prevented any great damage.

USED THEATER PROGRAMS ARE CLEANED AND PRESSED

Rumpled programs left in the seats by the patrons of one theater are no longer swept into the rubbish bin. Instead they are renovated—cleaned and pressed, in fact. Between 200 and 300 are picked up each night, piled in stacks of 50 each, and pressed flat in a bookbinder's press for 24 hours. Emerging flat and unwrinkled from this process, they are then run through rubber rollers which erase all finger prints and stains. It is said that it is impossible to distinguish these reclaimed programs from those just off the printing press.

GREAT OIL TANKS FLOATED LIKE EGGSHELLS

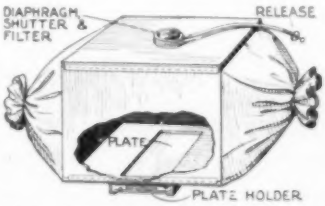
"Yo-ho, and a barrel of oil!" should have been the chant of 20 darkies as they pulled a 33,000-bbl. iron tank down an artificial lake. The scene was certainly unusual, but it represented an ingenious bit of engineering which easily moved five great oil tanks to permit reorganization of the plant. A continuous levee was thrown up around the tanks; water was poured in from numerous fire hydrants, and when it reached a depth of 11 in. the tanks floated like eggshells. A few muscular darkies did the rest. Aside from its convenience, this method moved the tanks with a minimum of torsion on the many plates.



A Small Dirt Levee and Water from the City Fire Hydrants Were the Features of This Ingenious Bit of Engineering. This Is One of the 33,000-Barrel Iron Tanks being Floated to Its New Position

ELECTRIC BULB RIVALS X-RAY IN BONE PHOTOGRAPHY

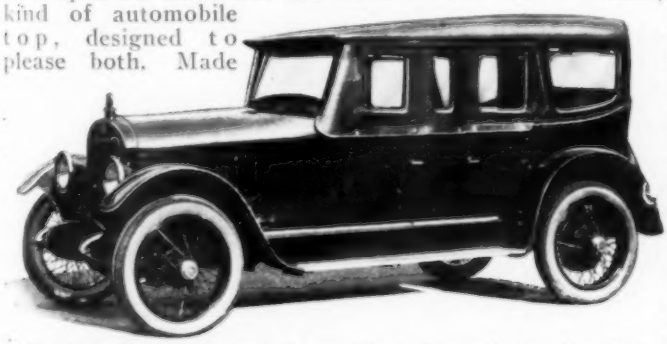
Everyone has placed his hand over an electric bulb and observed how the red glow penetrates the flesh; and by a few modifications of this common experience a physician has contrived a simple camera that seems to rival the X-ray in a limited field. Into a lightproof box, containing the member to be examined, he admits light from a tungsten lamp, filtered to pass only red rays. Passing through the hand or foot the red light strikes, at the bottom of the box, a photographic plate highly sensitized with an eosin solution. An exposure of one-half second makes the shadow picture.



Light from a Common Electric Bulb, above the Shutter, Pierces the Hand or Foot, and Makes an Excellent Shadow Picture on the Photographic Plate

NOVEL AUTO-TOP COMBINATION OF CLOSED AND OPEN TYPES

Out of the dispute between closed-car and open-car advocates has come a new kind of automobile top, designed to please both. Made of a waterproof, leatherlike material, the new top is removable, but does not fold. The plate-glass tonneau sides are fixtures, but forward of that point are removable side curtains, warmly padded, reinforced with steel frames, and having windows of plate glass instead of the conventional celluloid. Channels in the front curtain frames inclose the windshield brackets. An interior dome light completes the sedanlike effect of the ensemble.

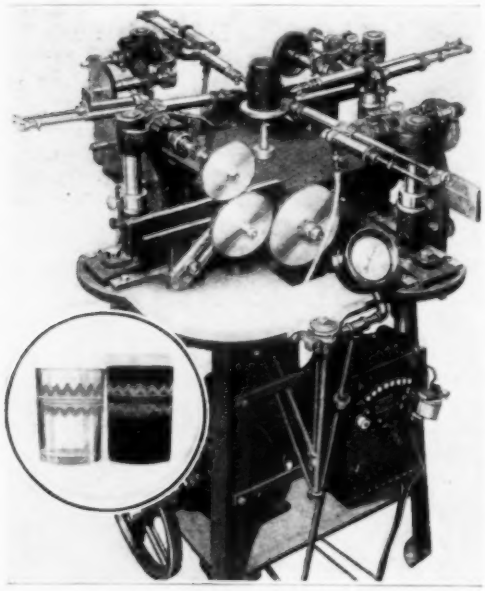


The New-Style Top on This Automobile Is Removable but does Not Fold. All Windows, Including Those in the Side Curtains, Are Plate Glass

¶The increasing importance of stellar observation has caused the Mount Wilson Observatory to drop the word "solar" from its name.

SUCTION HOLDS GLASSWARE ON ETCHING MACHINE

In etching fine glassware with a new machine, the article, a tumbler in this case, is dipped as usual in molten, acid-resisting paraffin or wax. The wax having cooled, the tumbler is inverted on a rotating table, where suction created by an air pump holds it firmly in place. Suction is then used again to move the four electrically driven scratching instruments into contact with the waxed surface, where cams give them a varying motion upon the revolving tumbler. Thus, there is traced in the wax a pattern which corresponds to the cams employed. The scratching finished, the pattern is finally "bitten" into the glass by an acid bath.



The Wax-Coated Tumbler is Shown Here on the Suction Disk of the Etching Machine. An Air Pump is Also Used to Move the Etching Arms into Contact

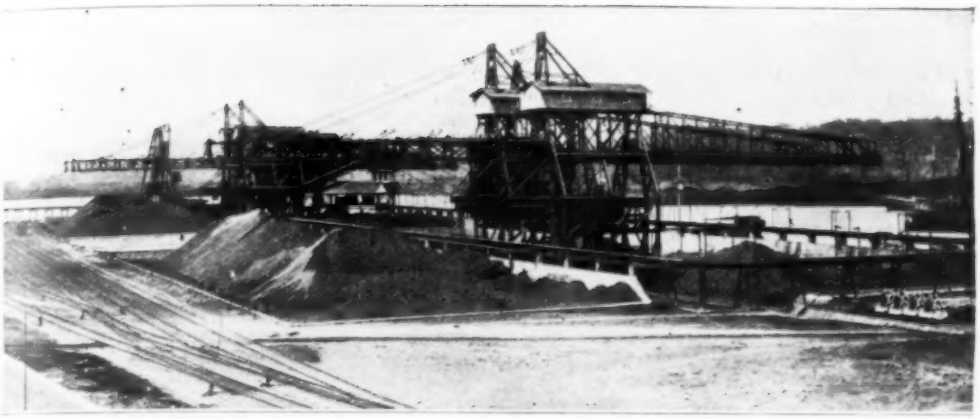
POLICE FORCE PLANS FOR AIR TRAFFIC ABOVE CITY

A police captain has been appointed major in charge of the air branch of the New York City Police Department. His service now consists of only 20 men, but will be expanded as necessary to regulate the future aerial traffic above the city. The fast scout planes which will be used in the work will probably be armed with machine guns firing tracer bullets.

INDIAN BRASS BAND LIVENS TRIBAL FESTIVALS

Since the American Revolution the Passamaquoddy Indians have lived near the mouth of the St. Croix River, in Maine, and have fought in every war on the side of America. The survivors of this farthest-east tribe now inhabit a small reservation near Perry, where they still observe the old tribal festivals, for which their own brass band furnishes the most modern music.

The Brass Band of the Passamaquoddy Indians is Here Pictured in Front of the Reservation Church. Many of the Costumes Are More Than a Century Old and are Decorated with Ornaments of Beaten Silver



COPYRIGHT, UNDERWOOD & UNDERWOOD

This Is the Coaling Station at Balboa, the Pacific End of the Canal, Whose Huge Plants Are Able to Deliver Coal to Ships at the Rate of 3,000 Tons an Hour. Here, as Well as at the Atlantic End, Vast Quantities of Coal are Stored for Supplying the Canal Shipping, the System as Now Operated Constituting One of Many Improvements Designed to Take Care of Post-War Trade

MAKING THE PANAMA CANAL PAY

A Report to the Stockholders

By E. T. BRONSDON

A FEW years ago you put $5 into the building, maintenance, and operation of the Panama Canal. So did your wife, and so did each of the other members of your family. Perhaps you were not conscious of making the investment. Probably you did not invest directly. Certainly, you have no papers in your vault or box at the bank to show positively that you own one share of stock in the Panama Canal. Yet this is the case. You own one share, no more and no less. Even if you purchased a million dollars' worth of the government bond issues that were devoted directly to the project, you still own but the single share, and equal with you is every other person possessing citizenship in the United States.

What has this $5 been doing? Has it paid dividends, or has it been thrown to the winds? What are its prospects?

The activity of these ninety-odd million five-dollar bills can best be shown in brief by enumerating the costs they have met. These are:

Building	$397,850,000
Repair (extraordinary)	29,033,000
Total	$426,883,000
Annual Expenses	
Interest (3%) on $426,883,000	$12,806,490
Government, operation, maintenance, sanitation, etc.	6,008,000
Annuity to Republic of Panama	250,000
Total	$19,064,490

The story of the building of the canal is history, and need not be touched upon. Through the Titan energy and capability of two men, Goethals and Gorgas, the big ditch was finished in 1914, a little ahead of schedule and with a slight margin remaining of the $400,000,000 expenditure planned.

Certain treacherous features of the terrain conspired to add to this cost, however. During the first year, following August, 1914, when the canal was opened, eleven slides occurred. These were minor affairs, stopping traffic in the canal for a period of time varying between one day and nine days for each. The dredging and repairing was not particularly costly, except that it made shippers fight shy of incurring this sort of delay; most lines that could have used the Panama Canal delayed starting until it could be depended upon more fully.

Then, on Sept. 18, 1915, just as traffic was picking up slowly, came the disastrous slides at Culebra. Hundreds of thousands of cubic yards of bank caved into the canal, and traffic was stopped definitely for seven months. During the time that intervened between the series of accidents and the opening, on April 15, 1916, a new scheme for protecting the banks was initiated; since then it has been carried out wherever the slightest danger of further slides threatened.

This was the terrace or "plateau" system. At the edge of the water, the bank slopes gradually to a level three feet above the canal. Instead of continuing in a slope, or rising in an abrupt precipice, as had been the case at Culebra, Gaillard,

and Coffin cuts, the soil then is chopped away to make space for the first terrace. This is ten or more feet in width—varying according to the "overhang"—and ends in another rise. The second rise and those that follow may not be slopes; in most cases they are sheer, like the sides of the blocks of the Great Pyramids of Egypt. Except in two or three instances, it has not been necessary to terrace back farther than 30 ft. from the canal, but often even this amount has called for the removal of sufficient dirt to cover an ordinary city block to a depth of 10 ft. Since the work was done with a thoroughness that nothing less than an earthquake can undo, in this article the costs are grouped with the building expense under the head of extraordinary repair—really part of the first expense, if one would care to view it in this manner.

This is not the total sum, however, which must be considered part of the original investment made by the people of the United States. Up to August, 1918, the close of the fourth year of operation, the average annual expenses slightly exceeded $19,000,000, not taking the extraordinary repair into consideration. A good part of this—viewing the Panama Canal as established, and not discounting for other advantages than the income received—could be called net loss.

The first year of operation yielded a gross income of approximately $5,260,000. The second year—killed by the seven months of entire inactivity, and the resultant inertia of shipping, not to speak of the inroads made by the war—totaled only about $2,400,000.

The third and fourth years, due to the fact that a great grain-shipping route was opened between Vancouver, British Columbia, and Liverpool, England, and also that the United States began to call extensively upon Chile for nitrate for munitions use, the income of the canal rose to an average of $617,000 a month.

This brought the total gross income for four years' operation to $22,468,000. The expenses for this period were $76,257,960, leaving a deficit for the period of about $53,789,960. At first blush, it would seem quite evident that we all have wasted our five-dollar bills, investing them in a project that could lose over $13,000,000 a year for us! We could find few commercial or industrial projects with a similar record in which we still would keep faith.

But courage! When the Panama Canal tolls were fixed by President Taft, in November, 1912, the assumption was that it would be inadvisable to charge more for the use of the waterway than the amount charged for passage through the Suez Canal, to wit, $1.20 a net ton for freight and passenger vessels. Charging more than this would have diverted the shipping passing between our eastern seaboard and all west-coast ports of South America, from the Chile nitrate ports southward; it would have sent all carriers plying between Europe and Valparaiso also to the Straits of Magellan, for via the canal these vessels could save only 65 cents a ton in time and distance. This added to the differing fuel costs would make a total saving of from 95 cents to $1.40 a net ton. Obviously the Panama Canal could not hope for all of this latter trade anyway, but with the charge above $1.20 a ton, net tonnage, practically none would use the waterway. For ports like Callao, Iquique, and Esmeralda, of course, the charge might be slightly higher, with the canal route still being less expensive, either from our own seaboard or from Europe, but their trade in peace time is relatively light.

The big nine-knot grain freighters now plying between Pacific ports, both in Canada and the United States, and Europe, can save 20 days in time and $5,500 by taking the canal route. For the shipping between the lumber docks of Oregon and Washington and the Atlantic seaboard, the saving is fully as great. When the Panama tolls are paid—they amount to close to $4,500 on one of these ships—the vessel saves net about $1,000 a trip. If tolls were increased to $1.50 a net ton, as has been proposed seriously in the past, the profit—and with it the reason for using the canal—would be wiped out, and the canal revenues thereby reduced instead of being raised.

This part of the shipping passing through the Panama Canal is, of course, important when the summing up of revenue is being made, but it is still only a small part of the whole question. What is perhaps the greatest reason why rates at the Panama Canal never should exceed those of the Suez Canal is that the United States has decided definitely to make a strong bid for commerce with Russia, China, Japan, and Australasia. In the past, nearly three-fourths of our own shipping—excluding coastal and lake vessels—has been employed in carrying goods to and from these countries. Now, with a large merchant marine as a definite aim, this section offers the most promising opportunity for such development. Amer-

COPYRIGHT, UNDERWOOD & UNDERWOOD

The Dry Dock at Balboa, with Its Total Length of 1,000 Feet, Is Fully Capable of Handling the Largest Ship Afloat, and Disposing of Any Demands That may be Made upon It by the Anticipated Enormous Increase of Merchant Shipping through the Canal When America's New Trade Vessels Are All in Action

can shipping operates under handicaps, thus far, of a wage scale higher than Europe's, and of higher cost as concerns the vessels themselves. In using the Panama Canal at the present rate, however, this American shipping actually can make Asiatic ports with slightly smaller transportation costs. This is not enough to offset the other handicaps as yet, but there are many schemes afloat by which the difference may be nullified. Raising the canal rates would throttle the greater part of the new marine before it was launched. It would not seem as if the Panama Canal would make much difference to the trade of the United States with the Orient, but as a matter of fact it does. Yankees trade with Australia, with China, with Russia, with Japan, and other countries of the Far East, almost exclusively through New York City. Before the Panama Canal was opened, this shipping had to use the Suez Canal—the trip either this way or around the Cape of Good Hope being more economical than the journey around Cape Horn for several reasons—and therefore, having as a handicap the width of the Atlantic Ocean to swell transportation charges, Yankees were at a great disadvantage in bidding against their European competitors. Now, provided the rates at Panama are kept as they have been, all of this particular disadvantage will have been done away with so far as the new marine is concerned.

It seems, therefore, that the assumption made by President Taft was justified. We cannot protect our investment by raising rates at Panama. We must look in a different direction.

The truth of the matter simply is that when the canal was opened no one expected that expenses could be met by the business of the first year—or indeed, of the first decade. The government estimate placed the canal on an earning basis in 1925, though a few connected with the project were more hopeful of attaining at least an even break between expenses and income several years earlier.

Expenses were not expected to be as heavy, but the European war sent prices on labor and materials soaring. Our own entry into the conflict did not help matters any, so instead of a yearly bill for $17,250,000 as was estimated, we have had to add nearly two million to this. As all costs will descend gradually during the next decade, we cannot expect to get along with the estimated amount for many years to come.

The estimate, made at the time of opening the canal, granted an income of $5,000,000 to the canal from shipping the first year, this amount gradually increas-

COPYRIGHT, UNDERWOOD & UNDERWOOD

Here Are the Shop Buildings and Pier at Balboa, More Evidence of the Canal's Preparedness for Any Amount of New Business. The Floating Crane Just This Side of the Pier, in the Right Half of the Picture, is Declared to Be the Largest Ever Built, Well Able to Handle Any Work It will Encounter

ing year by year, until in 1925 the gross-income forecast was $19,000,000.

Actually the first year exceeded the estimate by more than $250,000. We have reviewed in brief the catastrophes of the succeeding year. With the great war swinging into its stride, the canal had to give up definitely the idea of coming nearer to clearing expenses. The point for us to bear in mind particularly is that the great project has had no sort of a chance to demonstrate its possibilities. Instead of looking forward to 1925 for the meeting of expense and income, we must grant an extension equal to the period of the war. Whatever deficit is incurred must be charged against the original investment, and paid off by an amortization fund when a profit is made from the enterprise. The estimate gave a profit from the canal of $3,000,000 in 1930, and recommended that this amount be taken yearly for amortization. If all goes now according to schedule, this point should be reached in 1934.

As a matter of fact, these figures take into consideration only the amount of American shipping using the canal that we possessed at the outbreak of the war. In reality we have now, built and on the ways, a new tonnage four times as great as our pre-war total. In addition, American owners now cannot sell American vessels to foreign registry, and the bars have been dropped to permit Americans to buy all the vessels abroad that they wish to purchase—something that had been taboo for years previous to the war.

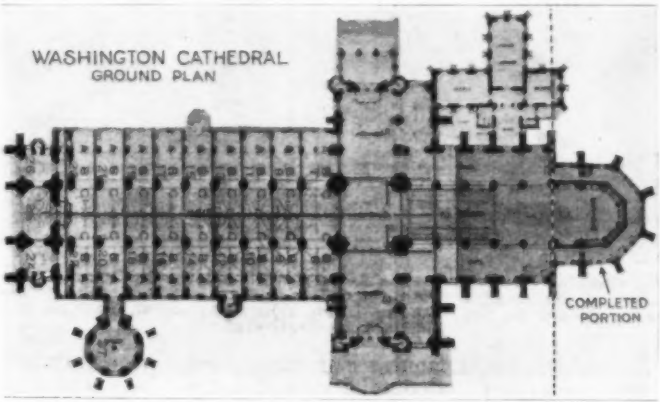
We are to have a real merchant marine; everyone is confident this is a fact now. Two or three factors of higher cost must be cleared up, but this probably will be done in one way or another inside the next year or two. The belief is prevalent in government circles now that there will have to be little or no subsidy. This is an astounding thing, bearing in mind the conditions which put the old American merchant marine out of business, but there is a solid groundwork of probability. The argument, stated tersely, is: The wage scale paid to seamen and shipbuilders abroad always has been the crux of the difficulty. Although Americans undoubtedly have been able to secure greater efficiency everywhere in return for higher wages, the difference has been too great. Now, however, conditions have changed —permanently, so far as we can see at the present time. Greater changes seem also to be under way. The workmen in Great Britain and the continental countries are out gunning for the low-wage employer. They have tasted power in war time, and it would be strange indeed if the far-reaching unrest, coupled with the terrific work of reconstruction that faces them, did not win for them a wage scale much higher than any which they have enjoyed previously. This, far from being a matter for concern or jealousy to Americans, is a cause for congratulation. Our products and our shipping will stand a better chance in the world markets if it

has for competitors labor that is paid as well as ours is—though the latter probability is remote.

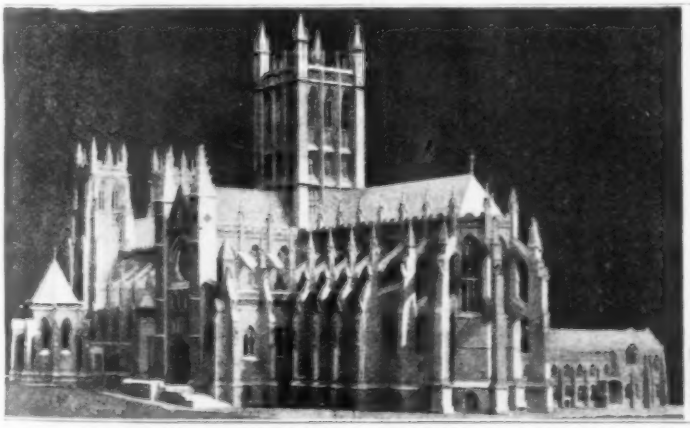
We may look forward to a marine the sailors of which are paid slightly more than the sailors of other nationalities. The difference, undoubtedly, will be largely made up by the advantage which our Panama Canal gives us in certain lanes of commerce. Our new marine will insure the finances of the canal in the future, making a happy bond of reciprocity. In another decade both our merchant marine and our great Panama project should be on a paying basis. In the meantime, for those jealous stockholders who wish an immediate return on their five-dollar bills, we might call to notice the undisputed fact that each year we spend many times the amount necessary to run the Panama Canal on our navy. It is the estimate of conservatives in the Navy Department that owning the canal makes our whole navy at least 50 per cent more efficient as a safeguard—so the jealous investor may, if he wishes, regard his $5 as the premium on a national insurance policy of indisputable merit.

ODD "SLICE" OF CATHEDRAL SHELTERS WORSHIPERS

In days to come a stately cathedral will rise 220 ft. from a lovely wooded hill, near the national capital. It is estimated that, when finished, the structure will cost between seven and eight million dollars, and hold 25,000 worshipers standing, or 7,000 seated. At present, however, only a part of the crypt and the small chapel to the east of the high altar have been completed. Yet, that religious services may be carried on, the chapel has been inclosed by a temporary wall of corrugated iron, making this perhaps the most peculiar-looking place of public worship in America. A good-sized congregation can assemble in the crypt, which is reached by a flight of descending steps at one side.



Religious Services are Already being Held in This Cathedral, Although Only the Part to the Right of the Dotted Line has been Completed. A Wall of Corrugated Iron Seals the Open End



This Is the Architect's Model of a Great Cathedral That will Some Day Crown a Large Hill near Washington, D. C. Its Most Interesting Feature at Present, However, Is the Small Slice at the Right Which has Already been Completed

TEST DEGREE OF INCAPACITY OF CRIPPLED SOLDIERS

Crippled French soldiers draw pensions varying according to the extent to which they are incapacitated for work. Instruments had to be devised, therefore, to test and measure their degree of physical disablement. For measuring joint movements, a simple hinged lever moving over a graduated arc is used in different sizes. Two modified forms of the "ergograph" are applied to the determination of movement and fatigue in large and small muscles. In these, weight-lifting levers operated by the patients rotate register drums, upon which metronomes record the time. Vasomotor irregularities are studied with a pneumatic device; while the various palsies and tremors are gauged by a machine all their own, which takes account of slight movements in any direction.

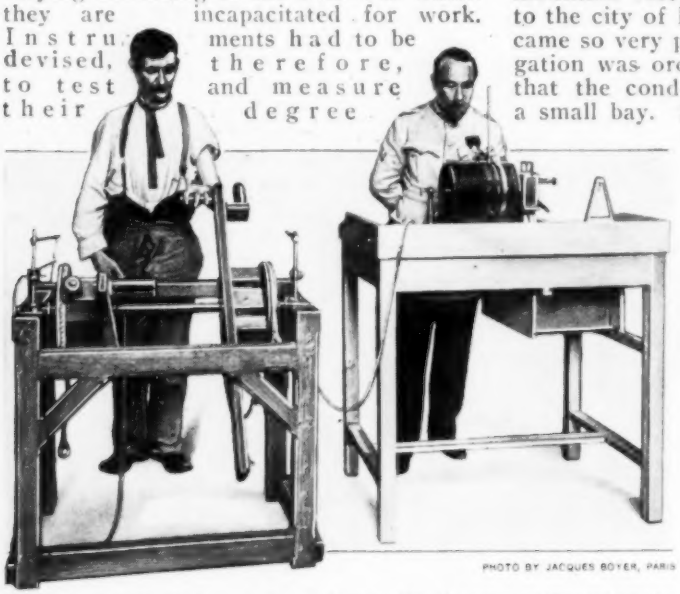


PHOTO BY JACQUES BOYER, PARIS

The Crippled Ex-Fighter at the Left Tries His Muscles by Operating the Levers of the Machine, While the Officer at the Right Studies the Result by the Record on the Rotating Drum, Where Movement, Fatigue, and Time are All Registered

VICTORY MEDAL FOR SOLDIERS OF ALL ALLIED ARMIES

Every soldier who fought in the allied armies is to receive a "Victory medal," the design for which already has been approved by the several governments. The face of the medal bears a winged Victory; the reverse an inscription, "The Great War for Civilization," in the language of the country conferring it, and the appropriate device of arms.

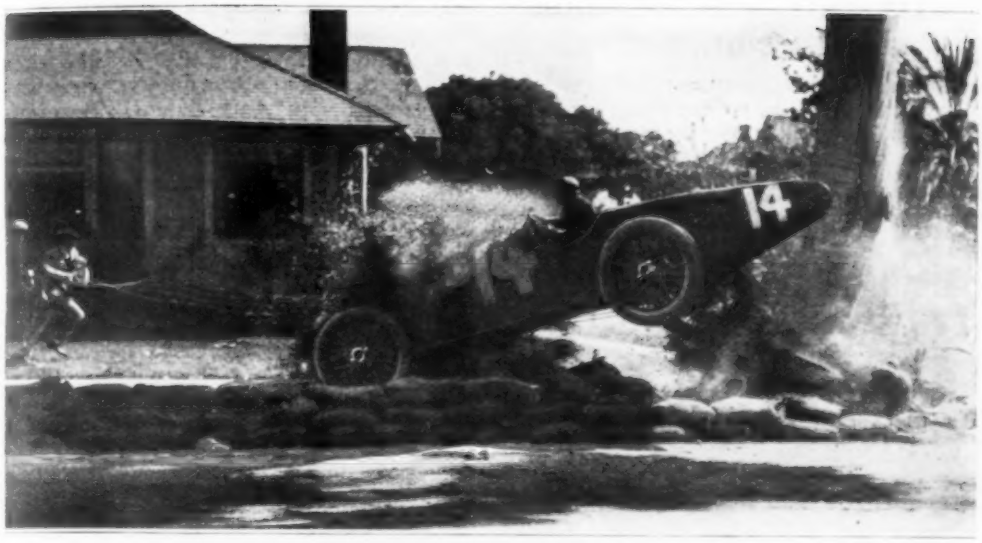
LEAKY LAKE BOTTOM COVERED WITH BLANKET OF CLAY

Underground leakage from a natural mountain reservoir which supplies water to the city of Portland, Ore., recently became so very pronounced that an investigation was ordered, and it was disclosed that the condition was most serious in a small bay. So a dike was built across the bay on a substantial riprap foundation. Leakage still continued, however, through the silt-filled interstices of the rocky bottom. To fill these, a raft was built of cedar logs, and equipped with a gasoline engine and propeller, and a wooden hopper of 5-yd. capacity. Securing a mixture of clay and gravel at one side of the lake, the material was dumped on the leaks in amounts depending on their nature. A blanket, one foot in thickness, was usually enough, but for cracks among large bowlders twice that amount was sometimes necessary. Gauges placed in the lake and in various neighboring streams indicate that the leakage has been largely stopped.

HUGE CLOWN'S FACE GRACES THE GREAT WHITE WAY

Novel readers may learn at last what the author sees in imagination when he describes the hero's "fine, open face." The opening in this fellow's face is about eight feet wide. His eyes roll, too, as the pleasure seekers yield up their dimes to see the big show inside.

¶ Traveling at an average speed of 172 miles an hour, a British pilot is said to have made the London-Paris flight in the record time of 75 minutes.



IT TAKES MORE THAN SANDBAGS TO STOP A RUNAWAY RACING CAR

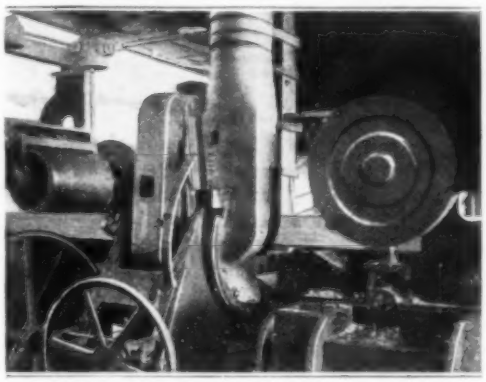
A HIGH-VELOCITY racing car will not take a right-angle turn, and a two-foot barricade of sandbags will not stop it. These principles of physics were demonstrated in a fraction of a second during a recent California road race. The driver of the car, not sufficiently familiar with the Santa Monica course, undertook to round "Death Curve" without slacking speed. Refusing to bend its route, the car took the wall of sandbags like a thoroughbred horse, the rear wheels clearing the top by more than a foot. It wound up in a position at ease on the lawn in front of a bungalow, much to the perturbation of the occupants.

LINCOLN HIGHWAY'S LAST GAP ELIMINATED BY GIFT

With a recent gift of $100,000 it is announced that two Nevada stretches of the Lincoln Highway will be improved, thus filling the last gap in the first American transcontinental highway. It is the sentiment of the donor that the work should properly be done by the state and Federal governments, but he is glad to make a personal sacrifice that the finished road may be presented to the American people as an object lesson. It is felt that the greatest value of this pioneer highway lies in its educative value for the general public.

IMPROVISED PLANING MACHINE FOR BEVELING SHIP PLANKS

Because of the changing angles of beveling on ship planking and ceiling, much of the work of finishing these surfaces is usually done by hand. In a shipyard at Seattle, Wash., a horizontal timber planer of the ordinary form was reconstructed by removing its frame and substituting a side-cutting ship planer. This machine, with its head adjustable to any required angle, was set between the rollers of the standard planer. With this combination of two machines, the angle may be changed while a timber is being beveled, and work handled from 20 by 20 down to



Side-Cutting Ship Planer in Place alongside a Horizontal Planing Machine, Taking the Position Formerly Occupied by the Frame of the Latter: The Vertical Pipe Is a Dust Stack

2 by 2 in. in size. Two or three men can handle all the operations of the machine and do the work of a crew of five to nine on the regular planer. Besides this saving in planing-machine labor, the improvised tool eliminates about 40 per cent of the usual sawing operations on planking and ceiling timber.

AERIAL COSTUMES NOW READY FOR FEMININE FLIERS

The ladies are taking as kindly to airplaning as they did to automobiling, and doubtless many are restrained from piloting their own planes only by lack of opportunity. Of all outdoor

Two Models Showing the Latest Styles in Costumes for Ladies Who Seek New Thrills by Navigating the Upper Air, Either as Pilot or Passenger: They are Offered by a Large Mercantile House in London

occupations, flying most imperatively demands special costumes. There is already at least one English establishment where a fair customer's request for the "latest" in aerial suits would occasion no embarrassment, and samples of two models would be immediately produced, complete from boots to fur-lined helmet.

AIR-SOUNDING SET INSTALLED ON BRITISH STEAMSHIP

Experimental air-sounding apparatus has been installed by the British Air Ministry on a 10,000-ton transatlantic cargo boat as another item in its after-war flying program. The ministry hopes to make the experiment a valuable preparation for transatlantic flying, and also a thorough test of the four appliances used: winch, wire, kite, and meteorograph. Two winches are used, as a matter of fact, one at the ship's bow and one at the stern, thus allowing the kites to be flown from either end to avoid entanglement with the rigging. The mooring cable, which will rise five miles into the clouds, is of fine steel, very similar to marine sounding cable. The kites themselves are collapsible and made of fine linen and bamboo in two types, the larger measuring about 8 by 6 ft. And finally, the meteorograph, the brains of the apparatus, consists of a revolving drum on which pen points register variations in humidity, pressure, and velocity of the air. When actually making soundings, this instrument will be towed four or five miles above sea level in the bigger box kite, while the small pilot kite will fly 400 ft. nearer the ship.

PICTURE SCREEN KEPT SOAKED TO MAKE IT TRANSLUCENT

In the entertainment portion of a Chicago hotel, where motion pictures are frequently shown, conditions demanded the location of the machine behind the screen. Although a fine silk screen was used, results were unsatisfactory until it occurred to the operator to wet the silk. The pictures seen through the translucent wet screen were so brilliant, even in a lighted room, that the practice was continued. The operator applies the water with a sprinkler whenever it appears to be needed. Under this treatment, however, the silk lasts only about six weeks.

METAL-SPRAYING PROCESS NOW USES ELECTRIC ARC

That ingenious art known as metal spraying, developed some years ago, now is further improved by the bold application of the electric arc to its peculiar conditions. The tubes of the former oxy-hydrogen flame are replaced by two wires, of the metal desired for the work, which are fed forward by an arrangement inside the spraying "pistol." The wire points form an arc in front, and a jet of compressed air sprays the melted metal. The instrument weighs less than three pounds.

¶A bulletin from the government fuel administration emphasizes the fact that the greatest single factor in the economy of a steam plant is the way in which the exhaust-steam problem is handled.

CLOTHING PRINCIPLES TAUGHT IN GOVERNMENT COURSE

While all civilized persons are interested in clothes, few really know very much about them. A better acquaintance with textiles would assure keener judgment in buying, and comprehension of design principles would raise the standards of taste, while the skill in care and repair already possessed by most women may be made still more effective. The Federal Board for Vocational Education at Washington, D. C., has prepared, under the title "Clothing for the Family," a general course in the economics of clothes, which includes instruction in all these subjects. The work is in pamphlet form, being Bulletin No. 23 of Home Economics Series No. 1. Particularly valuable and interesting is its critical study of the various materials that go toward making up a complete wardrobe for the whole family. Technical subjects are simplified by numerous diagrams.

SALVAGE FROM OCEAN BEACH MAKES COZY STUDIO

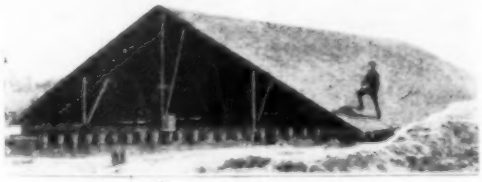
From scattered driftwood, wind-broken branches, and sea-worn stones along the ocean beach, a "nature man," near San Francisco Bay, has built himself a cozy little studio. Making a few expenditures, chiefly for concrete and frame timbers, he was able to complete the structure for less than $100.

COPYRIGHT, PRESS ILLUSTRATING SERVICE

This Dignified Little Studio was Built from Driftwood and Stones Salvaged from the Ocean Beach. Less than $100 was Spent for Other Building Material

SHINGLE ROOF GUARDS ARMY BALLOONISTS

There was not one chance in a thousand of a balloonist finishing a parachute drop in the sticky depths of the gas plant's sludge pit; but the authorities of a large army balloon school avoided all risk of such accident by covering the sticky surface with a substantial shingle roof.



This Roof, at an Army Aeronautical School, Prevents a Balloonist from Falling into the Mire of a Sludge Pit

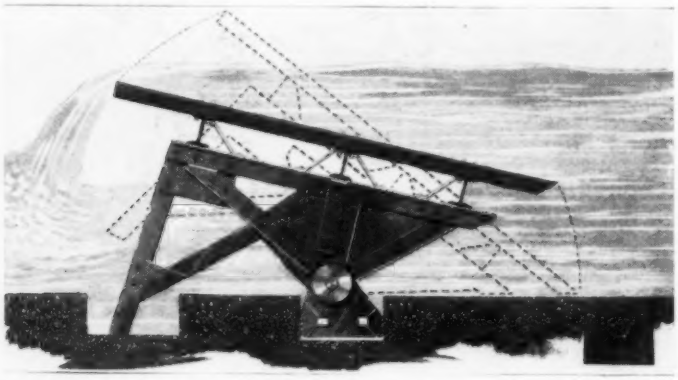
TOOLS CAST FROM NEW STEEL NEED LITTLE MACHINING

A newly developed steel that seems particularly desirable for dies, taps, and other cutting tools, changes its form so little during the hardening process that castings have the appearance of smooth forgings, and need almost no machining. The texture is uniform and close-grained, and castings may be subjected to high temperatures without scaling. Because of this heat-resisting property it is claimed that the walls of annealing boxes may be made much thinner with this material, and that the original shape and weight is retained through many more firings than when malleable or cast iron is used.

¶ A considerable vein of pitchblende, from which radium is extracted, has been discovered near Buckfastleigh, in southern Devonshire, England. The ore yields over 26 per cent of uranium oxide, and the lode will be developed immediately.

AUTOMATICALLY TILTING DAM REGULATES FLOOD WATER

Power rights of a mill, about eight miles up the Gunpowder River from the city waterworks of Baltimore, Md., were threatened by the city's plans for a new dam. City engineers solved the problem by constructing a tilting crest for the dam, which automatically discharged the flood water when the river rose above a predetermined level. The crest, of 12 by 2½-in. timbers, 6 ft. 2¼ in. long, normally presents an upstream face inclined 40° from the horizontal. The steel frame on which it is mounted is pivoted on the top of the masonry dam so that the weight of water passing over it will tilt it forward. This opens a space, 14 in. high, just above the masonry, clear across the dam, allowing the flood water to escape. The crest is made in 27 separate units, with six different tilting points, but all 4 ft. high from the masonry except the center unit. This is 3 in. lower, to provide a normal channel and carry off floating débris. The crest tilts back to closed position when the water subsides.



Tilting Dam in Its Open Position, Releasing the Flood Water under the Toe of the Dam: The Heel Rests in a Keyway Which was Formed in the Masonry for Possible Future Extensions. When the Water Subsides, the Dam will Tilt Back to Its Normal Position, as the Dotted Lines Indicate

OLD TIMBER WALL KEEPS FIRE FROM GREAT LUMBER YARD

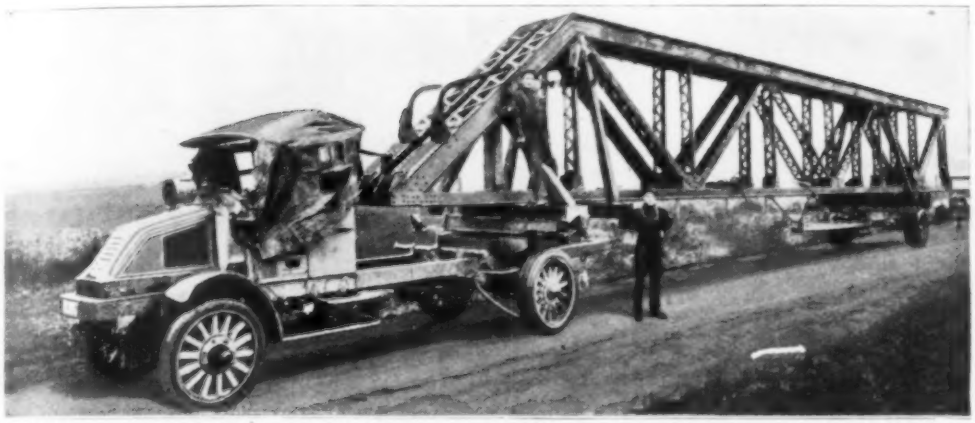
The oily, well-seasoned timbers of two Portland, Ore., lumber mills were recently consumed in a fire that roared for three hours and kept fire fighters a hundred yards away. A third mill was not even scorched, however, thanks to the protection given by a 10-year-old fire wall of 2 by 6-in. planks, laid flat on top of each other to a height of 35 feet.

AMERICA IS NOW INDEPENDENT OF EUROPE'S DYE INDUSTRY

All-American dye industry is now preparing to displace the full list of essential coloring materials formerly imported from Europe. A traveling exhibit of dyestuffs and processes arranged by a combination of producers of aniline derivatives, is giving public demonstration of that important and interesting fact. Direct comparisons of German and American-dyed fabrics of cotton, wool, and silk, subjected to rigorous tests for permanency, establish the excellence of the domestic product. Indigo, alizarine, carbanthrene blue, alizarine sapphire, and alphazurine are becoming available in commercially adequate quantities. A total of 174 aniline colors under various classifications, with additions that will be made from time to time, assures the textile industry that the old dependence on imported dyestuffs has vanished forever.

HUNDRED-POUND SCRAPBOOK HOLDS HISTORY OF WAR

No subject was ever given so much newspaper space, for so long a period, as the last—we hope—war. To have kept a complete scrapbook on it seems an appalling task. A Seattle, Wash., man, whose hobby is scrapbooks, undertook the effort in August, 1914, never realizing, of course, what he had started. But he bravely stuck to it, and now the book is closed. It weighs more than 100 lb., and contains literally thousands of columns of war reports and pictures clipped from the compiler's favorite papers. Most remarkable of all, it is carefully indexed, making it a really valuable work. It is being used for reference by two army officers who are writing a history of the state's war work.



Bridge Span, Over 100 Feet Long, Hauled 20 Miles by Motor Truck and Trailer: Wood Beams on the Truck Chassis Supported the Front End of the Span, but Because of Its Weight, No Fastening was Needed at the Trailer End Except the Chains That Held the Trailer Tongue in Line

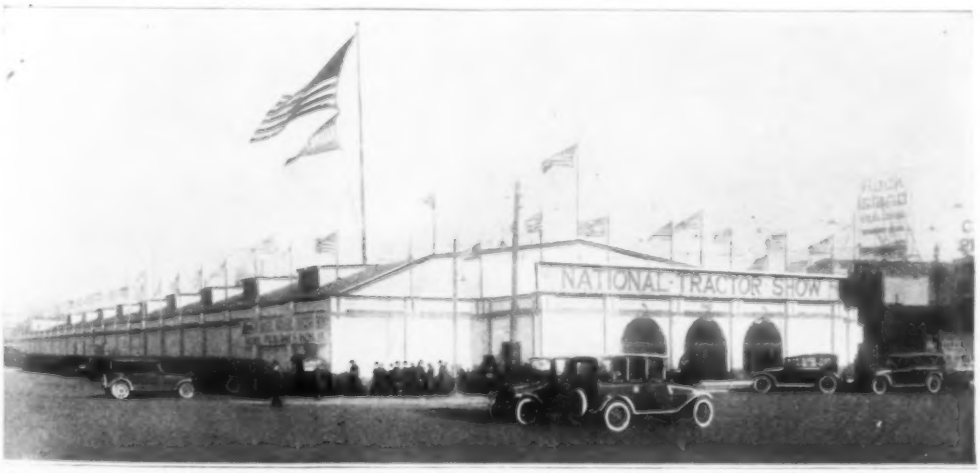
HUNDRED-FOOT BRIDGE SPAN HAULED BY MOTOR TRUCK

There seems to be no limit to the hauling capacity of the motor truck, when a little ingenuity is used in adjusting the load. A steel bridge span, over 100 ft. long, was recently moved 20 miles by highway in Whatcom County, Wash. A platform and braces of wooden beams held the forward end of the span on the truck chassis. The heavy two-wheel trailer was only chained to the steel structure, as the weight of the load made any special fastening unnecessary.

Survey shows that 74,541,700 acres of swamp land in the United States can be reclaimed by drainage.

GREAT EXHIBITION HOUSED IN SPECIAL BUILDING

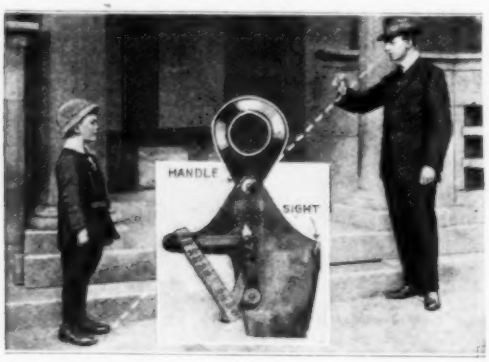
One of the largest buildings ever erected for such short occupancy was recently constructed for the seven days' exhibition of the National Tractor Show, at Kansas City, Mo. The $40,000 structure was more than two blocks long, had a floor area of 110,000 sq. ft., was lighted by electricity, and warmed by 200 steam units that maintained a temperature of 70° despite the prevailing wintry weather. An additional $10,000 was spent for decorations, which transformed the interior into a trellised garden. It is stated that the building sheltered the largest exhibition of tractors and power-farming equipment ever assembled.



This Vast Temporary Building Sheltered the National Tractor Show, at Kansas City, Missouri, during Its Seven Days' Run; 80,000 Persons Viewed Here the Greatest Exhibition of Tractors and Power-Farming Implements Ever Held in This Country or Elsewhere

POCKET-SIZE DISTANCE SCALE HELPS TO FOCUS CAMERA

Focusing scales on hand cameras are often criticized, but it is usually the operator's eye that is at fault. Accurately measuring distances is easier than guessing at them, with a tiny "range finder" now on the market. This celluloid-and-metal pocket piece has a sighting point at one edge and a reading scale at the other. A peculiar feature is its adjustability to the height of the user by turning a pointer. When held before the eye, gravity takes care of the correct relative position of the parts. The user, looking over the sight at the base or ground line of the object, reads the distance directly on the scale.



Use of the Distance Scale is Illustrated in the Large Picture, While the Insert Details the Device Itself. The Point at the Right Side Is the Sight; the Reading Scale Is at the Left; the Curved Center Scale Is for the Height of the User

WALNUT ASSOCIATION WANTS BRANDING MACHINE

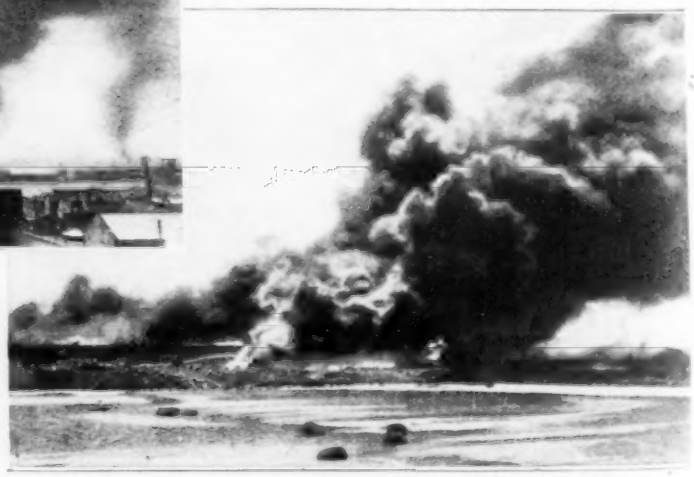
A prize of $10,000 goes to the inventor who first devises a satisfactory machine for branding the shell of each English walnut in a yearly $10,000,000 crop. Each device submitted will be tested by a committee from the large walnut growers' association. The present system of marking each sack with the association label is considered unsatisfactory. Persons interested should communicate with the California Walnut Growers' Association, Los Angeles.

SMOKE COLUMN RISES MILE FROM HONOLULU FIRE

Curious students from the local college measured the dense smoke column rising from an oil fire in Honolulu Harbor and found it 4,600 ft.—almost a mile—in height. Starting from the accidental explosion of a soldering torch, the blaze burned for two days, consuming 500,000 gal. of gasoline and kerosene, and at one time threatening to ignite 30 tons of powder stored 200 yd. away.

Students from a Honolulu College Used Their Knowledge of Trigonometry to Measure the Smoke from This Oil Fire, and Found It to Be 4,600 Feet in Height

¶ Mississippi barges are already loading from two complete 300-ft. sections of St. Louis' new 900-ft. municipal dock.



This Oil Blaze Started from an Exploded Soldering Torch, Burned for Two Days, and Destroyed 500,000 Gallons of Gasoline and Kerosene, the Damage being Estimated at $200,000

Beautiful Shoshone Falls, Where the Snake River, in Southern Idaho, Drops 200 Feet in Its Cañon of Basalt Lava, and Out-Niagaras Its Sister Cataract in the East: The Arrow Points the Location of the Giant Stairway Built to the Base of the Falls by the People of the Valley

BALLOON OBSERVERS TRAINED ON MOUNTAIN PEAK

Cadets attending the Army Balloon School, at Arcadia, Calif., seeking commissions as observers, are now being given their preliminary training upon the summit of Mt. Wilson, near by. In the making of a balloon observer there is always a certain amount of training that must be undergone to accustom the student to the appearance of the earth, and points and objectives thereon, from a high elevation.

This preliminary training is made especially difficult when carried on from the basket of an observation balloon. The student is usually made more or less "seasick" by the constant movement of the balloon basket in the air. He is further handicapped by the fact that, whenever the balloon basket moves, it seems to him that the landscape has shifted and that he has remained in a stationary position all the time. This movement of the basket causes the untrained cadet continually to lose sight of objects upon which he desires to center his attention.

Training on the mountain peak eliminates much of this difficulty. The same effect of elevation is obtained as from the balloon, and, besides, the cadet has the advantage of acquiring his early training from a stationary position. Furthermore, classes of 25 or 30 men may be taken to the mountain top and trained by a single instructor, as compared with two or three that could be taken in a balloon basket, thereby saving considerable time.

SHOSHONE'S GIANT STAIRWAY REACHES BASE OF FALLS

Because there was no other way for tourists to reach the foot of Idaho's Niagara, the magnificent Shoshone Falls, the people of the Snake River Valley built a stairway. It is an extraordinary stairway. It goes down, for 300 vertical feet, through a cleft in the towering cliffs of Shoshone's basalt cañon. Sometimes it hugs one wall of the great fissure; sometimes it bridges across to the other side. Here and there it passes through veritable caverns, as the rugged walls meet overhead. But at all points it is safe for the traveler, for its location was selected only after weeks of study. Its supports are iron bars imbedded in the solid rock and rein-

At the Left, Shoshone Falls Stairway is Seen Emerging from Its Rocky Cleft. At the Right Is a Distant View of the Whole 300-Foot Structure

forced with heavy timber braces. The long stair, which starts on the cliff 50 ft. above the falls, is divided into many flights. On the landings between them are benches; they are needed, for the steps, cut from 2-in. plank, number over 300. The scenic reward for descending them, however, is extremely liberal. Funds for building the stairway were provided by popular subscription.

MOTORISTS WARNED TO WATCH FOR LANDING PLANES

An airplane in landing slows down to about a mile a minute; but this is fast enough to make it dangerous for anything

The Familiar Warning at Railroad Crossings Has a New Rival in This One on an Aviation Field

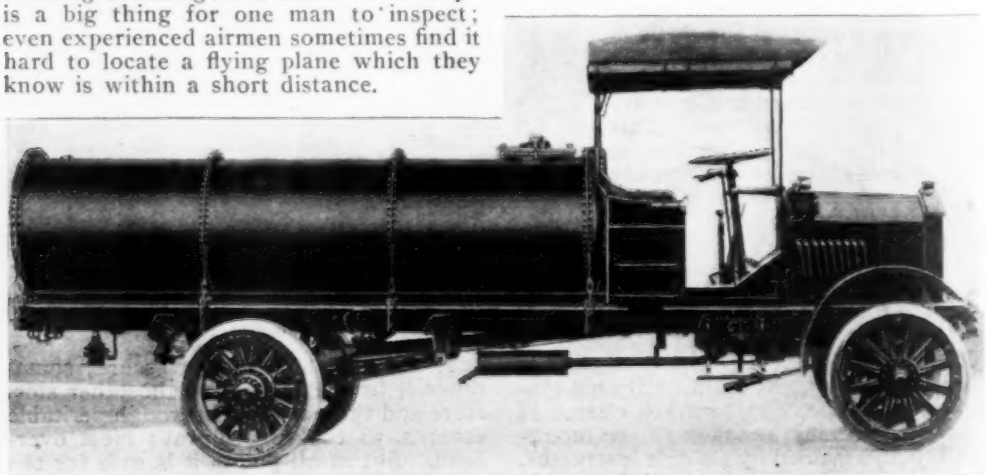
it may hit. To avoid accidents, large signs have been placed along all roads traversing a government aviation field, advising very careful inspection of the skies before entering the dangerous areas. The "sky" is a big thing for one man to inspect; even experienced airmen sometimes find it hard to locate a flying plane which they know is within a short distance.

ROOSEVELT'S BIRTHPLACE BOUGHT AS MEMORIAL

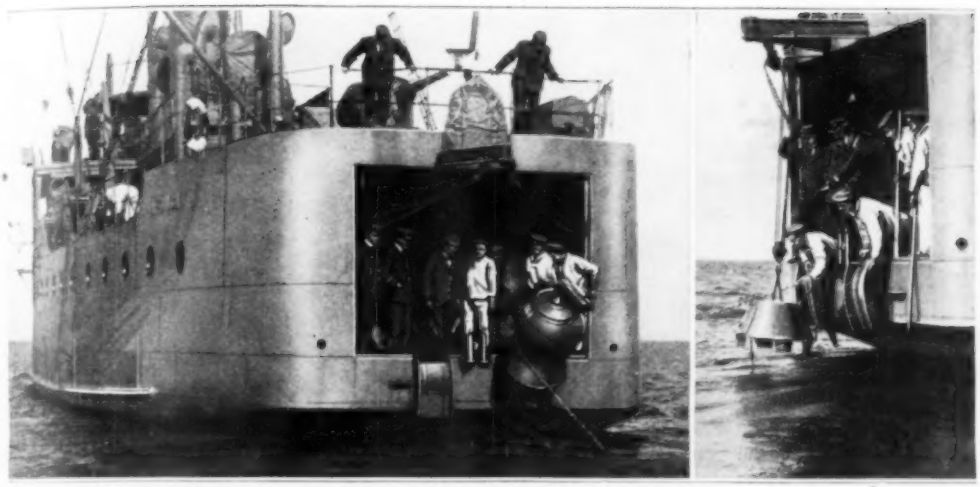
Colonel Roosevelt once protested against "meaningless mausoleums and monuments to the dead." Accordingly an organization of women, formed to perpetuate his memory, has bought his birthplace in New York with the intention of making it more than a memorial; they would make it a busy center of citizenship activities; would have men, women, and children leave its assembly halls resolved on better citizenship and a deeper love for America. The association is attempting to interest women in all parts of the United States in the undertaking.

TEN THOUSAND DRINKS TRAVEL IN ENAMELED TANK TRUCK

Anticipating an unprecedented rush for mild beverages this summer, a huge steel tank lined with glass enamel has appeared as a new form of motor-truck body. The tank's capacity is 658 gal., which divides into 10,528 half-pint drinks. It is made in three sections, gasketed and bolted together, and easily taken apart for cleaning. The silicate enamel used is seamless, impervious, and noncorroding, and is unaffected by expansion or contraction of the steel upon which it is fused. A manhole with enamel-lined cover is fitted with a 2-in. intake connection. The outlet cock, of the same size, at the rear may be padlocked. A 3½-ton truck chassis forms the mounting, from which the tank is readily removed.



Steel Tank of 658 Gallons' Capacity, Lined Throughout with Seamless Glass Enamel, Mounted on a Three and One-Half-Ton Motor-Truck Chassis: The Three Sections, Bolted Together as Seen, are Readily Taken Apart for Cleaning



COPYRIGHT, PRESS ILLUSTRATING SERVICE

Dutch Mine Sweeper "Medusa," Taking Aboard a German Mine Found Floating in the North Sea, Where Many of These Concealed Menaces Still Threaten Peaceful Navigation: At the Right the Same Ship is Observed in the Process of Setting Out a Mine Anchor

DUTCH NAVY'S MINE SWEEPERS STILL SCOURING NORTH SEA

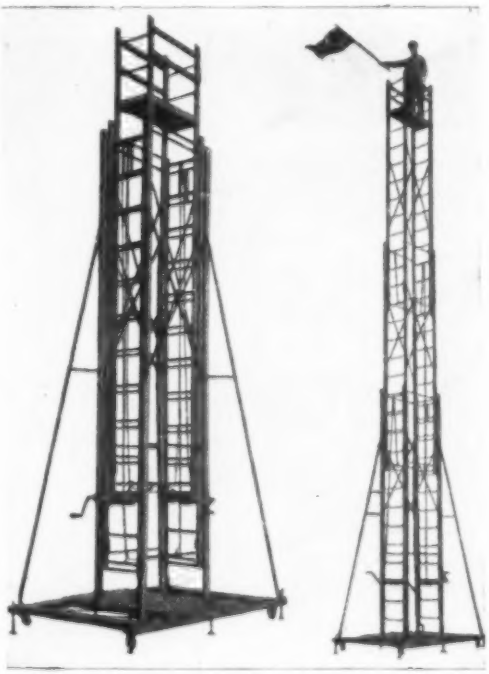
Germany's fleet is gone, but in the North Sea many mines still float, held dangerously out of sight by their anchors and constituting a constant menace to peaceful navigation. So the square, ugly forms of the mine sweepers are a welcome sight as they go about their beneficent but hazardous task of cleaning up the sea. The Dutch navy has found a great deal of this necessary work to do, and its mine-scattering and sweeping equipment is kept busy.

BUILDINGS QUICKLY ERECTED WITH WOODEN NETTING

Several exhibition halls and assembly rooms have been built in Norway by attaching to the uprights a "netting" fashioned from wooden rods about a third of an inch square in cross section, which are bound together with tin-plated iron wire, and subsequently covered with a durable plaster. Structures of this sort are easily and quickly constructed, and are said to be useful even in wintertime.

EXTENSION TOWER OF LADDERS MAKES PORTABLE SCAFFOLD

For work above stepladder range there is now to be had a portable telescopic tower of ladders, solid and safe. Two extension ladders, rigidly braced together with steel, rise vertically from a broad base. Rollers are provided for moving, but in use the tower rests on solid legs. A railed platform at the top accommodates two men. Folded, the tower occupies little space and is readily transported; but when set up it expands, by a system of ropes, drums and cranks, to any desired height up to 40 ft. or so.



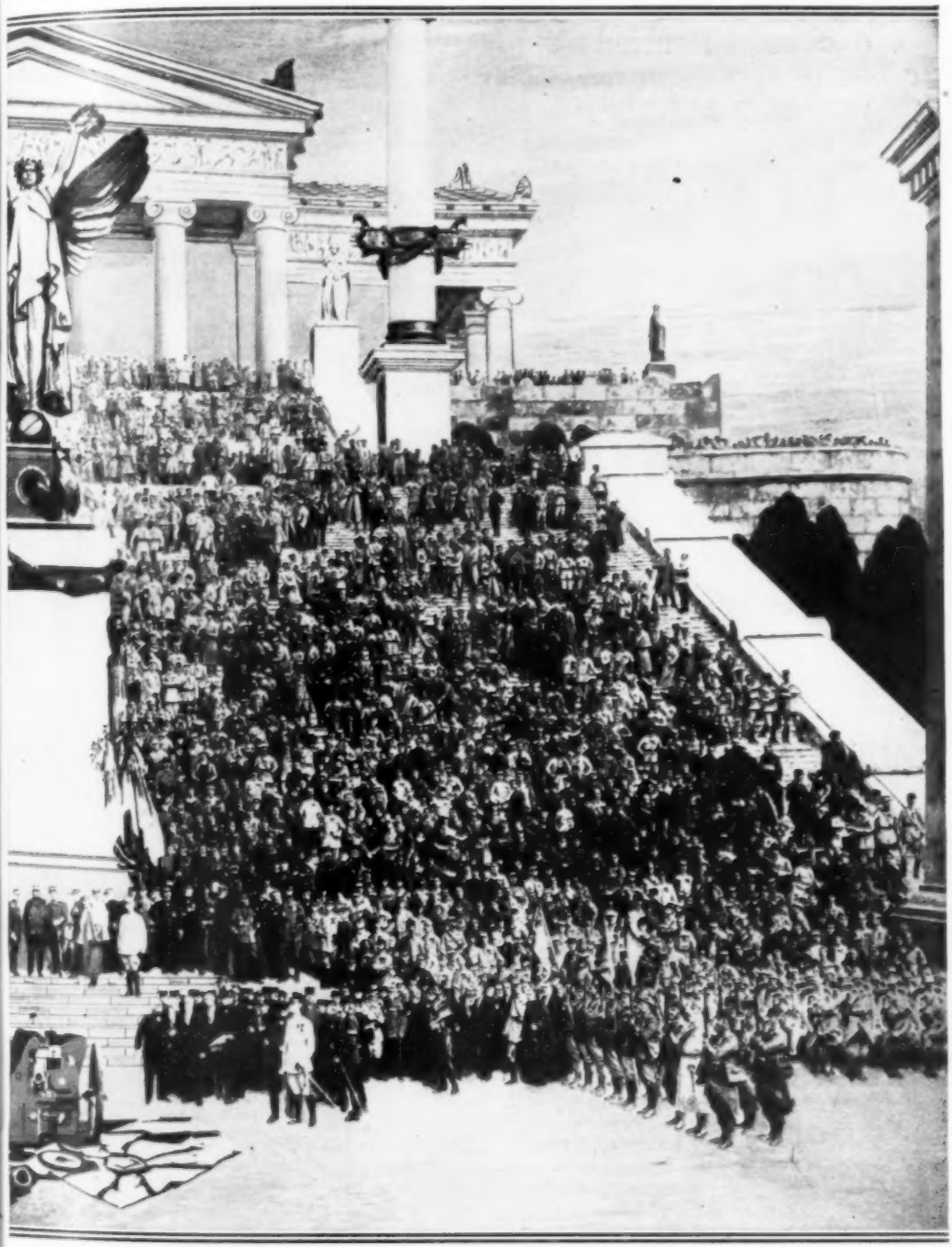
Left View Shows the Ladder Tower Collapsed; at the Right It is Seen Extended for Work. Each Ladder Consists of Three Parts

COLLECTION OF HERO PORTRAITS FILLS CENTER

PHOTOS BY HENRI MANUEL

KNOWLEDGE that the figures in the foreground are four feet tall gives one some idea of the heroic propor now completed after five years' painstaking toil. Along its 400-ft. length, which is arranged, as illustrated Sea to Switzerland, as it would appear to an airman flying parallel with it. Rolling hills, winding roads and rivers, in nature. And in the center of the landscape is set the Temple of Heroes, with a Winged Victory dominating allied nations, soldiers, sailors, airmen, nurses, diplomats, even postal clerks, each one drawn with the most

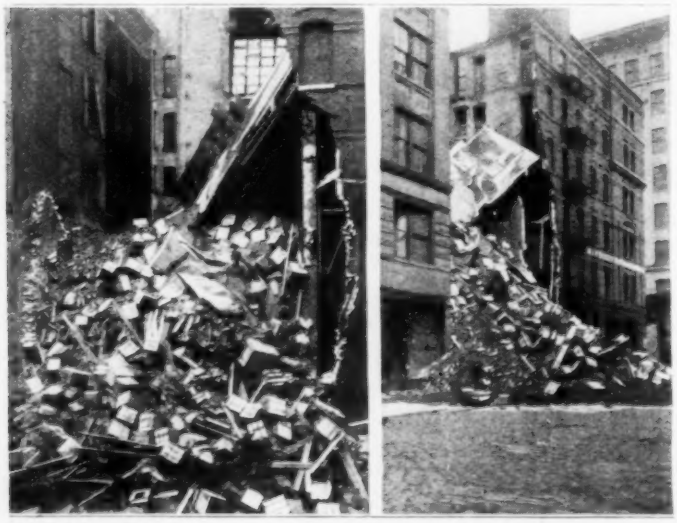
OF HUGE PANORAMIC PICTURE OF BATTLE FRONT



tions of this French painting, shown half finished in the Popular Mechanics Magazine for November, 1917, and in the insert, in a circular exhibition hall near Paris, is pictured the whole western battle front, from the North villages nestling in the valleys, Rheims, Verdun, and other war-torn cities, all are spread before the spectator as the broad steps. Crowding the steps and porch of the temple are arranged the elect of France and the other careful attention to details, secured from life or photographs of the dead.

WAREHOUSE COLLAPSE SPILLS GROCERIES IN STREET

Canned goods, bricks, plaster, nuts, girders, and wine were all hopelessly scrambled in the loud collapse of a six-story New York tenement, which had been converted into a grocery warehouse. No one was hurt, although three men were at work on the top floor when the building began to groan and crack. They were able to descend by the fire escape which was luckily untouched.



Quick Use of the Fire Escape Saved Workmen from being Crushed to Death in This Confusion of Groceries and Rubble. The Warehouse Was Formerly a Tenement and had been Loaded Far beyond Its Strength

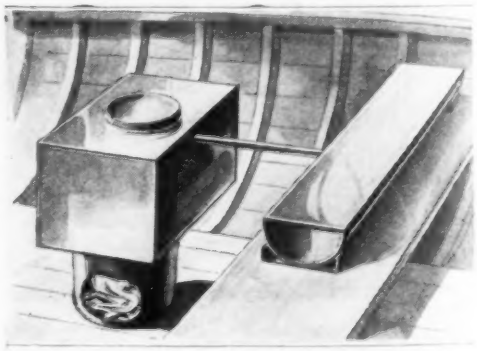
FIGHT AGAINST YELLOW FEVER TO BE RENEWED AT ONCE

The opening of the Panama Canal and the consequent establishment of new trade routes called the attention of scientists some years ago to the danger of a world-wide yellow-fever epidemic. As a result a commission visited all affected areas in Central and South America in 1916, and returned, declaring that, with the extermination of the mosquito, the complete eradication of the plague was possible. So, in January, 1917, a program was drafted—to be postponed indefinitely on America's entrance into the war. But the work of the commission has now been renewed, and it is announced that Doctor Gorgas, Surgeon-General (retired), U. S. A., will shortly sail for Central and South America to coöperate with local authorities in a final extirpation of the plague.

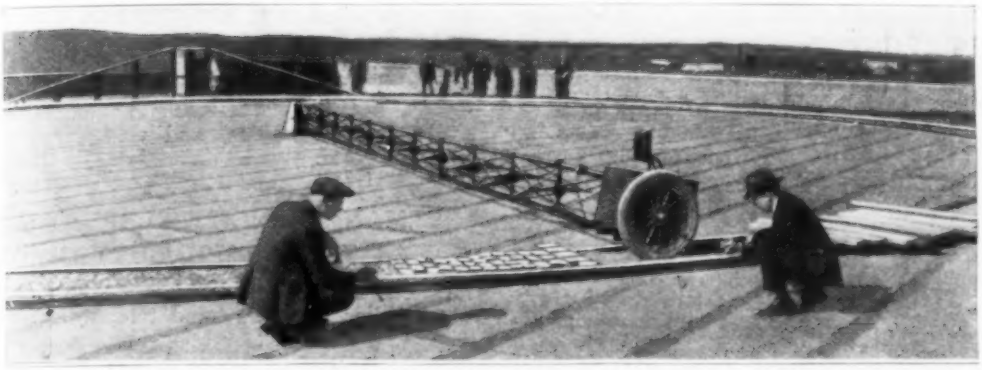
¶ Norway has a factory which is reported to obtain aluminum from a mineral known as Labrador stone, hitherto regarded as valueless.

HARD-TACK CAN AND PUMP PIPE SAVE SHIPWRECKED SAILORS

When the "Dumaru," U. S. Shipping Board steamer, was struck by lightning and abandoned off the coast of Guam last October, 32 persons were crowded into a single lifeboat. The scanty supply of fresh water was exhausted on the 13th day, with no help in sight. Then the mechanical instinct, spurred by necessity, came to the front. The desperate castaways tore a pipe from the boat's bailing pump, connected it to a tin container that had held hard-tack, and dipped the end into the now empty water tank. A metal bucket served as a stove; oars, shoes, parts of the boat went in as fuel. As the salt water boiled in the hard-tack box, the tank, cooled by the sea, turned the steam into life-giving fresh water. When land was sighted on the 24th day, the crude still had saved 14 lives.



Crude Still Which Saved the Lives of Shipwrecked Sailors Last Fall: The Bucket Stove and Hard-Tack Box, at the Left, Sent Steam from the Salt Water through the Pipe to the Tank, at the Right, Where It Condensed into Pure Drinking Water



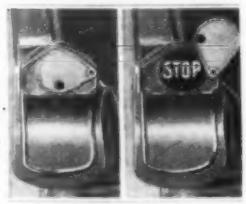
Curious One-Wheel Car and Circular Speedway Located on a Roof Top in Denver: It is Used for Testing Tires, the Path of Which may be Obstructed with All Manner of Hazards, Giving a Genuine Rough-Road Test at 35 Miles an Hour

BUMPY SPEEDWAY ON ROOF TOP IS ONE-WHEEL TIRE TESTER

A motor speedway on a roof, over which races only one car with only one wheel—so far it looks like an old-fashioned conundrum. Actually, though, it is a serious and useful device for giving automobile tires a real road test in advance. The "speedway" is a large circular track, wide enough for one wheel, and varying in surface from smooth cement to broken bricks, sand, and mud. There is even a 45° grade at one point. The single wheel is mounted on the end of a long steel arm pivoted at the center of the circle. A small car carries the electric driving motor and controls, and enough weight to equal service conditions. It runs continuously at about 35 miles an hour, with the tire under critical observation all the while. The roof of a Denver factory is the location.

WARNING SIGNAL DISPLAYED AS BRAKES ARE APPLIED

Equipped with the latest automobile safety signal, the motorist may proceed to forget all about it. A small pipe connects the intake manifold to a valve that opens on depression of the brake pedal, thus lifting the cover from an illuminated warning. It follows that the signal will automatically warn a machine in rear each time the brakes are applied for a stop or turn.



BETTER GALVANIZED IRON BY NEW PROCESS

Valued for its weather-resisting qualities, galvanized iron or steel has long been produced by dipping sheets of the metal into molten zinc, which deposits itself as a coating of small crystals or spangles. Occasionally, however, sheets have been produced with large spangles which, it was found, improved both the appearance and the noncorrosive qualities of the product, and hence increased the price it would bring. So one plant has raised the value of its output by treating high-grade molten steel with an alloy containing titanium before rolling it into sheets and subjecting it to the zinc bath. It is claimed that 75 per cent of the treated sheets emerge from the bath with the large spangles desired.

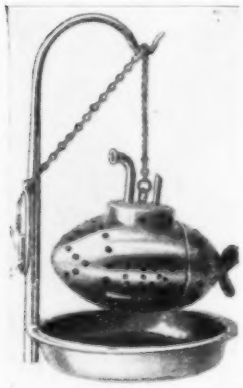
These Large Spangles on Galvanized Iron Lengthen Its Life and Improve Its Appearance

OVERINFLATION OF BALLOONS PREVENTED BY WATER VALVE

When a balloon is filled to capacity with gas, the addition of more may rip the bag. As an automatic safeguard against this danger a two-way Y-tube is introduced into the hydrogen manifold of the gas plant, one arm fitting into the sleeve which carries the gas to the balloon, the other being immersed in a pail of water. It is obvious that when the envelope is filled further gas will bubble out of the pail, enabling the attendants to close down the plant at once.

SILVER "SUB" WITH TEA CARGO SUBMERGES IN SAMOVAR

The Boston tea party knew nothing of submarines, but the party of today uses one as a tea ball. The "sub," less than two inches long and very fat, is made of solid silver. It hangs, while in "dry dock," by a silver chain from a silver derrick, with a tiny basin below, to keep the drip off the tablecloth. By grasping the propeller the "hull" is opened to admit the charge of tea.



AIRPLANE CARRIES DOCTOR TO HIS PATIENTS

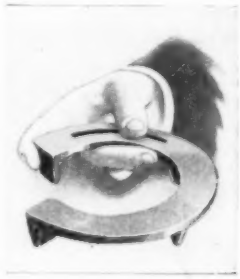
Along the ribbonlike islands of sand and swamp that parallel the North Carolina coast for more than 100 miles the government maintains a chain of coastguard stations, seven or eight miles apart. Slow-going boats have long been the only means of transportation; but when 200 inhabitants fell prey to Spanish "flu," it was computed that it would take a full month for the government doctor to visit them in this way. So the energetic health officer rode to the naval base at Hampton Roads, secured two flying boats, with pilots and mechanics, and visited every station in one day.

GERMAN TRENCH TELEPHONE HAS TELEGRAPH BUTTON

When talking was dangerous, the German soldier used his hand telephone for telegraphing. A push button in the handle, just where his thumb rested, was the key by which he changed his words to dots and dashes. The instrument is of the usual hand-microphone type, with a receiver at one end, a transmitter at the other, and a finger switch in the middle. The long mouthpiece folds in and covers the switch while carrying. Plug-ended cords allow connection anywhere.

NONSKID HORSESHOE MADE FOR PITCHERS

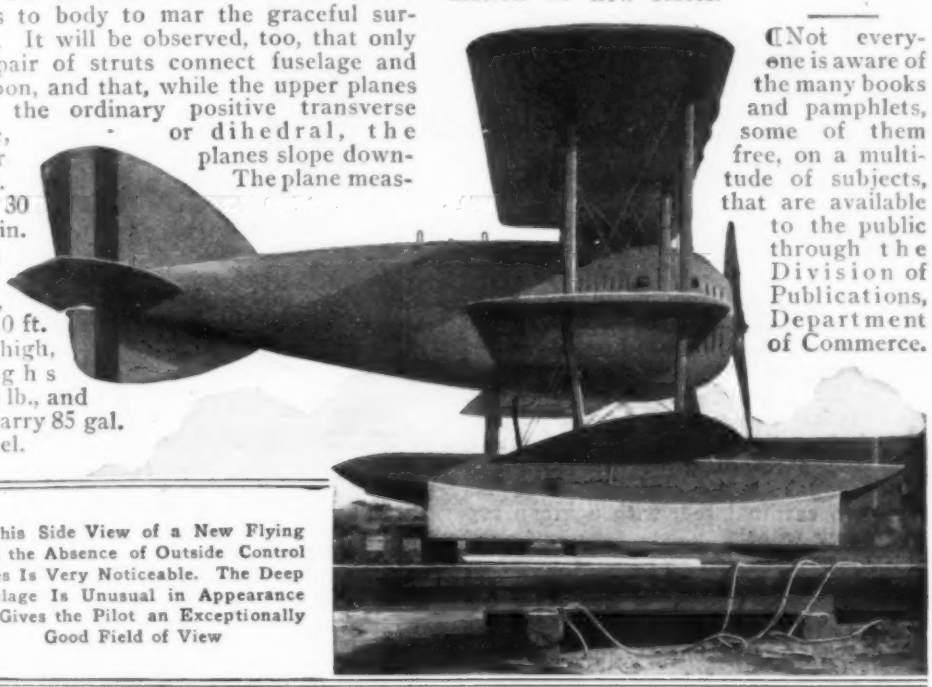
The attention of quoit throwers is directed to the four balanced calks on this patented horseshoe, which the inventor maintains will prevent wabbling through the air, or skidding on impact with the ground. He also provides a slit to secure tape or chamois skin in case the fingers of the throwing hand become sore or the player desires a larger grip.



¶ The coöperation of a British battleship in midocean, and special forecasts from the weather bureau of the British air service, will be at the disposal of any American or British airman attempting the transatlantic flight in an airplane.

FAST FLYING BOAT HAS GRACEFUL LINES

Driven by a 12-cylinder Liberty motor, a flying boat recently put on the market attains a maximum horizontal speed of 130 miles an hour, with a minimum of 62. It is a development of a speedy land machine intended for mail carrying, from which it differs chiefly in having a greater wing span and two sets of struts. In appearance it is very pleasing to the eye and rather unusual, as the fuselage is deep, and streamlined very effectively, with no control wires or struts from wings to body to mar the graceful surfaces. It will be observed, too, that only one pair of struts connect fuselage and pontoon, and that, while the upper planes have the ordinary positive transverse angle, or dihedral, the lower planes slope downward. The plane measures 30 ft. 9 in. long, 36 ft. wide, and 10 ft. 7 in. high, weighs 3,650 lb., and can carry 85 gal. of fuel.

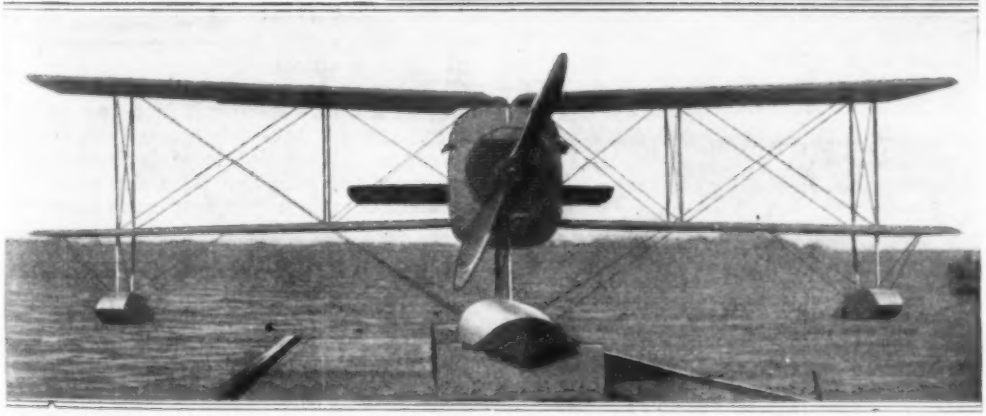


In This Side View of a New Flying Boat the Absence of Outside Control Wires Is Very Noticeable. The Deep Fuselage Is Unusual in Appearance and Gives the Pilot an Exceptionally Good Field of View

MORE REPUBLICS IN WORLD THAN MONARCHIES

Before the war the number of republics and monarchies in the world was about the same, but it is now computed that only 21 monarchies remain, compared with 29 republics. Germany, Austria and Russia have been included among the latter. China is the largest republic with 400,000,000 inhabitants; San Marino comes last with only 11,000. The number of republics will probably soon be increased still more by the formation of new states.

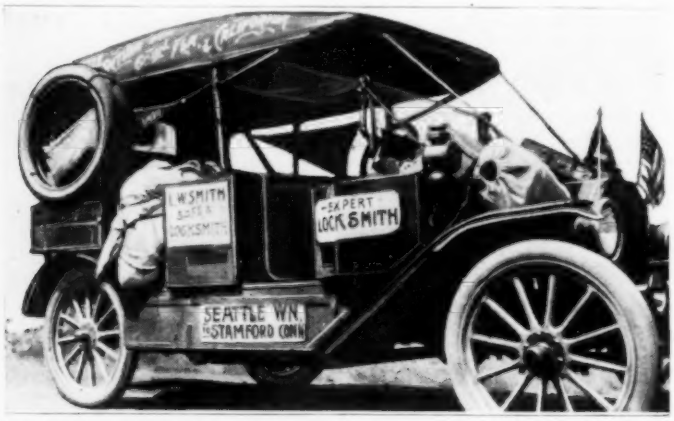
¶Not everyone is aware of the many books and pamphlets, some of them free, on a multitude of subjects, that are available to the public through the Division of Publications, Department of Commerce.



In Developing This Flying Boat from a Fast Mail-Carrying Machine, the Wing Span was Substantially Increased. Note the Opposite Dihedrals of Upper and Lower Planes

LOCKSMITH CROSSING COUNTRY LIVES AND WORKS IN AUTO

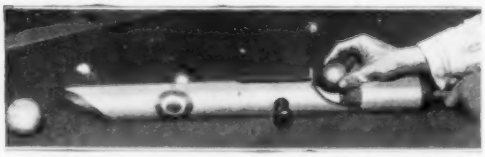
A complete locksmith's shop, a camping outfit, and the smith himself, all packed into a small and well-used auto, are making an 18-month tour from Seattle, Wash., to Stamford, Conn., and back by way of Florida. The car, with its extraordinary outfit, weighs 3,600 lb., about twice the normal figure for its kind; but as the owner made it himself, using the parts of three others, it has proved equal to the situation. He has it painted cardinal red, with a green top and yellow wheels.



This "Light" Car Weighs 3,600 Pounds When Equipped with a Complete Locksmith's Shop and a Camping Outfit. The Smith is Driving It from Coast to Coast, and Its Red, Green, and Yellow Coloring Attracts Customers in Every Town

PLAY GAME OF POOL WITH GUN INSTEAD OF CUSTOMARY CUE

"Shooting" a game of pool applies literally to a new method of playing the popular indoor sport. The cue becomes the plunger of a spring gun, consisting of a tube about 30 in. long with an opening near the breech to receive the cue ball. The muzzle is cut at a slant, with the longest side on top, giving a point for sighting. A side handle assists in holding for difficult shots.



COPYRIGHT, KEYSTONE VIEW CO.

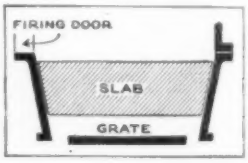
This Spring Gun Takes the Place of a Cue in Shooting the Cue Ball for a Game of Pool. As will be Seen, It Is Breech-Loading

FOREIGN MARKETS EAGER FOR AMERICAN LUMBER

Russia and Austria-Hungary formerly supplied the world with almost half its lumber. But now, facing the greatest demand ever known, reckoned at 100,000,000,000 ft., buyers learn that the Germans in Galicia and the Bolsheviki elsewhere have completely destroyed all Russian mills, and that Austria-Hungary, while actually rich, is yet economically impotent. Hence buyers are arriving in America from Europe, South America, Australia, and Africa, eager for every bit of lumber that available cargo space can handle. With such a market it seems possible that the United States, despite labor shortage and other difficulties, will become the world's greatest exporter of wood products.

FIRE-BOX WALL FOR FURNACE HELPS TO BURN SOFT COAL

Last winter's experience with soft coal, burned in hard-coal furnaces, gave the final test to a number of ingenious devices designed to help in the emergency. One of the simplest of these was marketed in the form of a slab of refractory composition easily cut with a chisel and hammer, to fit across the furnace fire box like a wall, dividing it into two parts, except for a three-inch space just above the grate. When soft coal is fired alternately on one side and then the other of the wall, complete combustion is assured.

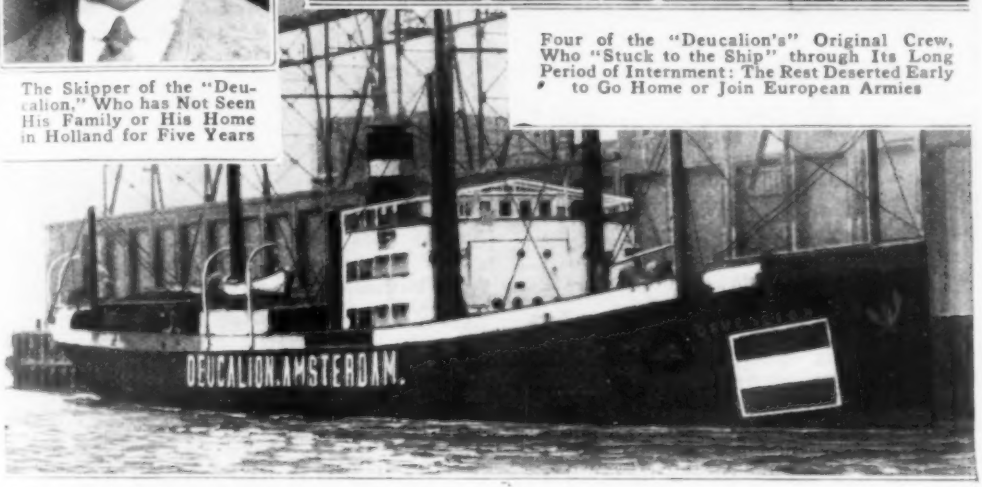


ALMOST FIVE-YEARS OVERDUE SHIP MAKES PORT AT LAST

Five years ago the Dutch steamship "Deucalion" packed a cargo of fruit at Smyrna, Turkey in Asia, and prepared to weigh anchor. Then the war broke. The port was closed. Even the doubtful privi-

The Skipper of the "Deucalion," Who has Not Seen His Family or His Home in Holland for Five Years

Four of the "Deucalion's" Original Crew, Who "Stuck to the Ship" through Its Long Period of Internment: The Rest Deserted Early to Go Home or Join European Armies



Dutch Steamship "Deucalion," Docked at Boston after Nearly Five Years' Internment at Smyrna, Turkey, Where Its Prow was Dented by a British Bomb Aimed at a German Ship Lying Alongside: The Vessel Was All Ready to Sail When War Broke Out

lege of running the blockade was refused, and the ship came to an enforced anchorage beside an interned German vessel. Here it was subjected to a secondhand bombardment by British fliers, who dented its prow while trying with partial success to sink the German. The perishable cargo was exchanged for one of tobacco, licorice root, and emery stones, as better suited to a long stay; but most of its crew deserted early. When finally the British occupied Smyrna and gave the vessel the first clearance papers issued; a pick-up crew took it to Mediterranean ports, where experienced sailors were secured. The run to Boston was made in 79 days.

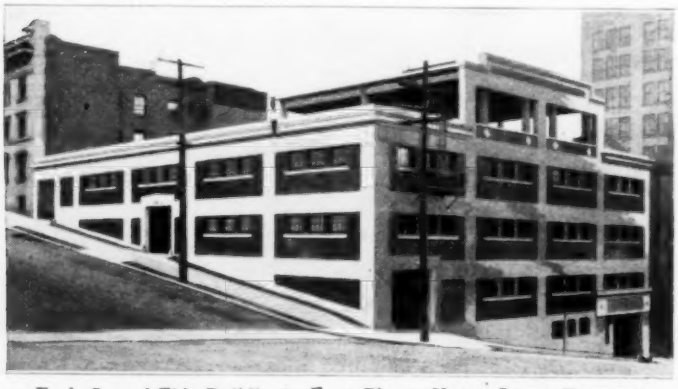
SPEAKING TUBE AND SHIELD FOR STREET-FLUSHER MAN

On the motor street flushers used in San Francisco, the operator sits at the back, and communicates with the driver through a speaking tube, mounted on the truck frame and ending in funnel-shaped mouthpieces at front and rear. To keep him from being bumped by other vehicles, a heavy iron fender, rigidly bolted to the frame, completely encircles him. This enables him to keep his mind off the hazards of his location and to concentrate on his work.

The Semicircular Fender of Heavy Iron, at the Rear of This Street-Flushing Truck, Protects the Operator from Other Vehicles. The Funnel Is a Speaking-Tube Mouthpiece, for Communicating with the Driver

FOUR FLOORS OF GARAGE OPEN ON STREET

By providing a street entrance for each floor the owner of a four-story garage quadruples his accessible storage space. This unusual convenience was made possible by locating the building at the intersection of two sharply sloping streets, and excavating to give all floors the same area. By using all exits the building may be quickly emptied of 250 cars.



Each One of This Building's Four Floors Has a Street Entrance of Its Own. With a Little Excavation All Floors were Given the Same Area

COAL DUST MIXED WITH OIL MAKES NEW LIQUID FUEL

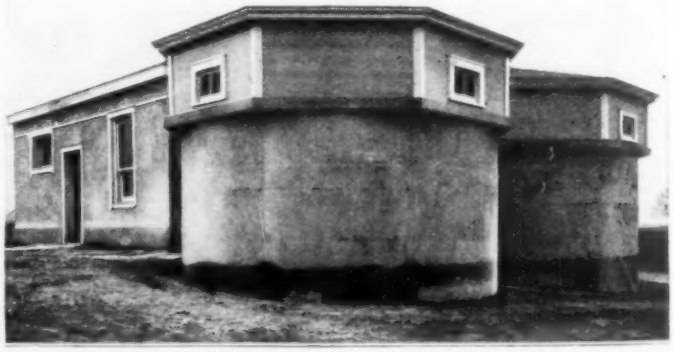
Liquids and solids do not ordinarily mix, and the idea of combining coal and petroleum to make a new fuel sounds rather chimerical at first. Yet that very thing has been done, and successfully, by pulverizing the coal so finely that it forms a colloidal, or suspended, mixture with the oil. This compound passes freely through all regular oil pipes and burners, so that it can be used for power and heat without equipment change; and it generates a greater heat value than oil alone. Coal dust, passed through a 200-mesh screen, mixed with a little tar in the oil, leaves no deposit even after months. Use of the new fuel in place of fuel oil on sea and land would save millions of barrels of oil a year.

PLASTIC ARTIFICIAL HANDS QUICKLY SHAPED FOR USE

Gelatin combined with dentists' modeling compound is the material out of which a surgeon of Washington, D. C., fashions plastic artificial hands for cripples. By softening in hot water, the hand can quickly be shaped to fit any requirement of the moment, from holding an implement to operating a typewriter. It is hardened after shaping by dipping in ice water. If it is desired to retain a certain shape, the hand may be removed and one differently shaped installed. The plastic member is a simple and wholly satisfactory substitute for complicated artificial hands with articulated joints which are mechanically adjusted for each requirement.

CONCRETE REPLACES STEEL IN SOFTENING TANKS

The concrete-silo contractor can erect water-softening tanks of this sort with but very little change in his equipment. The tanks pictured are part of a system that is supplying soft water at the rate of 4,000 gal. per hour, two tanks being used so that one may be drained of its softened water while the proper chemicals are being stirred into the other. Tanks of this kind are recommended by their permanency rather than their initial cost.



Concrete is Meeting with Some Favor as Material for Water-Softening Tanks. Two Are Necessary in the Type of Plant Pictured

Montana Coal Miners have Built Themselves These Fireproof Homes by Erecting a Wall beneath the Projecting-Rim Rock. These Modern Cliff Dwellings Are Quite Common in Certain Parts of Europe, Where Whole Communities Live in This Way

MONTANA MINERS BUILD HOMES IN ANCIENT STYLE

A characteristic bit of the Old World may be seen near Roundup, Mont., where Austrian and Italian miners have built their homes in ancient fashion, under a projecting-rim rock. By simply erecting a stone wall, they have a shelter that cannot be bettered for warmth in winter and coolness in summer.

SINGLE ELECTRICAL CONTROL ON TWO-LOCOMOTIVE TRAIN

When a railroad train has a locomotive at both front and rear, the forward driver can control both with an electrical arrangement devised for use on a French system. No train cable is needed, the power rail, or wire, in the case of electric railways, being used to transmit the control impulses. High-frequency currents at low voltage are generated in the front locomotive and picked up by selective apparatus in the rear locomotive, where they are made to operate the control mechanism. Varying the current frequency enables it to perform different functions.

ADVERTISING DEVICE GUIDES TRAVELER TO HOTEL

Tourists, hotels, and advertisers are all expressing satisfaction with a monster hotel directory fronting the street-car tracks at a large railroad station. The brevity of the instructions given is explained by the numbering of all cars and car routes throughout the city. Thus, to reach the hotel of his choice, the stranger simply boards the first car bearing the number opposite the name of his hotel.

A Glance Tells the Stranger in This Town What Car will Take Him to His Hotel. The Numbers Correspond to the City's Various Street-Car Routes

AMERICANS CAPTURE GERMAN MERRY-GO-ROUND

When the Second American Army took Stenay, about 25 miles north of Verdun, on Nov. 10, 1918, they found among the

Advancing Americans Found This Merry-Go-Round at Stenay, France, the Day before the Armistice

spoils of war a crudely built merry-go-round. From the photograph, which was found in a hut near by, it is evident that the German soldiers actually relieved the monotony of trench warfare in this way.

CATCHES LIGHTNING IN PHOTO AT PAINFULLY CLOSE RANGE

Night pictures of lightning are readily obtained by leaving the camera lens open until a strong flash occurs, but amateurs are seldom lucky in catching a good impression. A photographer at Waterloo, Ia., engaged in this pastime, was startled

Unusual Photograph of Lightning Flash: The Ramifications of the Near Branch and the Halation Effect of the Distant One Are Particularly Noteworthy

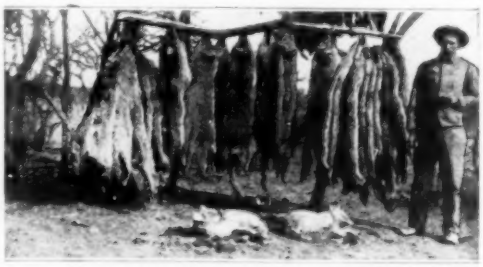
by the crash of a bolt which struck about a block from him. The camera faithfully recorded the image, and the result was worth a scare.

ONE-PIECE CONCRETE WALLS WITH DEAD-AIR CHAMBER

House walls of one-piece concrete containing a central dead-air space are constructed by an English engineer with a simple arrangement. The core for the air chamber is fixed, while the mold is moved upward as sections of the wall are completed. An alternative method is to fix the mold and move the core. The chamber may be the full size of the wall, but stronger construction results by forming concrete bonds in which are placed the iron ties. A wall nine inches thick would usually have a two-inch air space. Such walls are quite dry, and much stronger and cheaper than common brick.

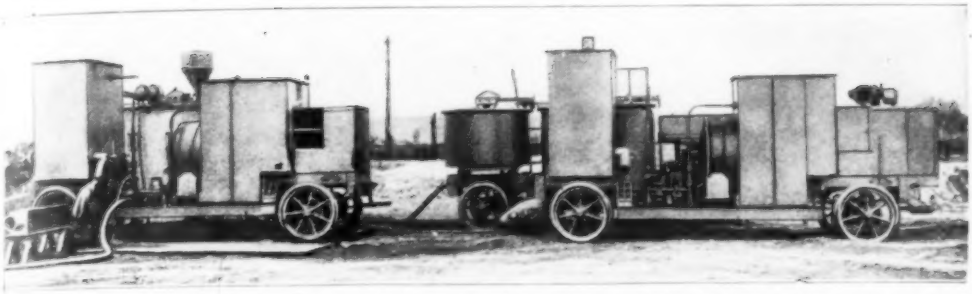
POISON PELLET LESSENING COYOTE NUISANCE

A wolf causes an estimated annual loss to western stockmen of $1,000; a bobcat, or coyote, of $50. Colorado and several



By Marketing the Pelts of Coyotes the Government Is Able to Reduce the Cost of Killing Them

other states reckon their annual losses from this source at more than a million dollars. Figures of this sort showed the Federal government that the evil was worth its attention. So the problem was referred to the Biological Survey, which perfected a poisoned ground-meat pellet that is far more effective than the trap or gun. Assigning men of its poison squad to definite territories, where the animals are lured by attractive bait, the government now reports that dead wolves, bobcats, and coyotes are being found in every corner of the range country. Although the animals wander far from the poison before dying, enough pelts are recovered and marketed each year to reduce the cost of killing to $10 a head.



The Army Balloon Service has Mounted This Two-Unit Gas Plant on Wheels, So That It may be Towed by Motor Truck Wherever Hydrogen Gas is Needed

PORTABLE GAS PLANTS FOLLOW ARMY BALLOONS

By the construction of portable gas-producing plants the army balloon service has greatly increased the efficiency and mobility of its organization. Under war conditions hydrogen gas was formerly conveyed from producing plant to the front in heavy steel cylinders, each holding, under high pressure, about 2,000 cu. ft. But the capacity of a captive balloon is often 50,000 cu. ft. or more, making the transportation problem a serious one. The new machine, however, may be towed by motor truck directly to the scene of operations, where it will produce gas fully as good as that from a permanent plant.

TRAVELING EXHIBIT TEACHES FOREST PROTECTION

The tremendous importance of timber conservation is being taught to farmers, railroad men, and lumberjacks of northern Canada by various educational campaigns. A feature of the work is the railway coach which travels wherever rails are laid, with a display of wireless outfits, miniature lookout towers, and airplanes, and a score of similar exhibits. The car also carries a lecturer who conducts visitors through the car in the daytime, and at night gives illustrated lectures in some local hall.

MONKEY WRENCH WORKS AT SEVERAL ANGLES

It often happens that some obstruction prevents the turning of a monkey wrench

The Ratchet Connection between the Head and Handle of This Wrench Gives It Eight Working Angles. The Ratchet Works Both Ways and is Locked or Released by Means of the Thumb Dog on the Handle

though the jaws fit the nut. A novel form of adjustable wrench has its head pivoted in the handle, with a ratchet connection. This not only allows the tool to be used at eight different angles, but makes effective even a very limited movement of the handle. The ratchet, which works either way, is locked or released by pressing on a small dog located where the user's thumb naturally rests.

This Railway Coach has Covered Four of Canada's Great Northern Provinces Preaching Coöperation against Forest Fires. On the Left Is the Wireless Outfit Which is Carried

THE FIRST FLIGHT

By SEARLE HENDEE

ONE'S first flight is much like one's first operation. He learns it is to be, and awakes to find it has been. Also he follows instructions with lamblike obedience. When things get in full swing—that is, when it is time for the ether and too late to back out—he thinks of his sins.

Not long ago I was closeted with the president of a well-known aircraft corporation. Suddenly he asked if I had ever been up. I thought of two late friends, both of whom met tragic ends shortly after offering to take me aloft, and as shortly before doing so, and replied negatively.

The president looked at his watch. It was four o'clock.

"I'll send you up this afternoon," he said, turning to his telephone, "Step downstairs and hear from me presently."

I did as bidden, and less than three minutes later, by the clock, two gentlemen approached briskly.

"This is Mr. Smith," said one of them. "He will drive you to the field. You will see Mr. Mackley. You will go up with Mr. Wehlan. Hope you have a pleasant flight. Good luck."

Things were moving. Anyway Mr. Smith was disappearing through a doorway. I caught up with him just in time to jump into a snorty roadster before it leaped ahead like a bronco spurred in the flanks by a drunken cow puncher.

"The field was six miles distant by map, but not so by motor car. . . . A moment later, atop a partly bald knoll, we approached a quaint little graveyard. A cemetery . . . holds a certain fascination for some folks."

The field was six miles distant by map, but not so by motor car. At least it was reached in scarcely that many minutes.

But in six minutes of rapid driving—or in what seems to be only six minutes—many things may attract one's attention. First, for instance, there was the wreck of an automobile draped about a telephone pole. Then there was an all-glass schoolhouse attended by boys who refuse to have summer vacations. The one suggested a grim thought, and the other seemed too fantastic really to be of this world.

The drone of a motor overhead was audible. Several thousand feet aloft an aeroplane, apparently gone crazy, was turning one somersault after another in dizzy succession.

A moment later, atop a partly bald knoll, we approached a quaint little graveyard. A cemetery that has the appearance of age—and this one had—holds a certain fascination for some folks. Old fashioned slabs, cracked, crumbled, and askew, with weather-beaten epitaphs and homely American names, hold interest for one who finds enjoyment in browsing around picturesque spots.

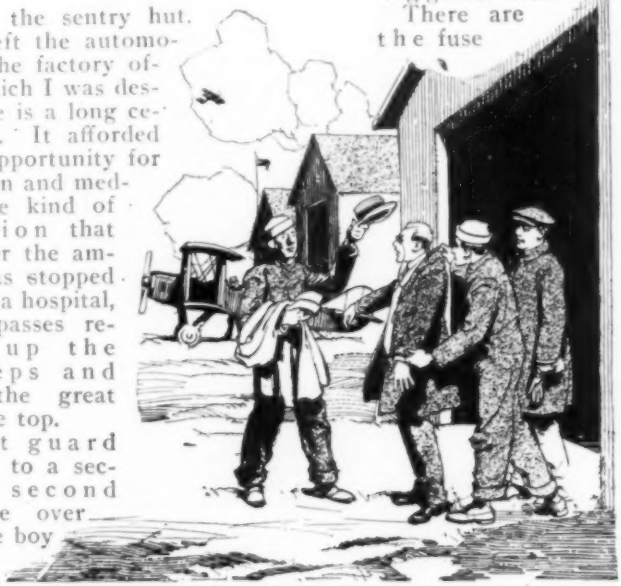
At least the place seemed interesting as I looked again at the sky-larking plane in the distance and my companion remarked, "That's probably Wehlan now. Flies like him anyway." All of which was interesting to know.

"The second guard passed me to an office boy on roller skates. The boy was a speedy convoy. In less time than it takes to tell it, I was signing my name to a pink tag . . . for the convenience of the coroner, no doubt."

We reached the field. Mr. Smith remarked in parting: "You are fortunate to go up with Wehlan," whatever that meant.

Between the sentry hut, where I left the automobile, and the factory office, for which I was destined, there is a long cement walk. It afforded the only opportunity for slow motion and meditation—the kind of meditation that comes after the ambulance has stopped in front of a hospital, and one passes reluctantly up the stone steps and through the great door at the top.

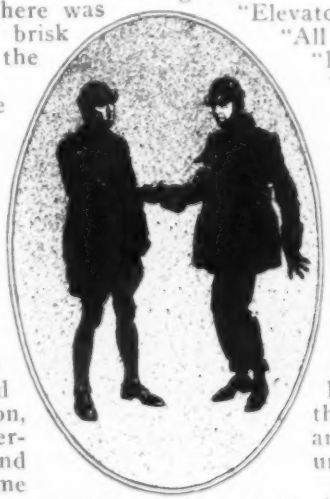
The first guard passed me to a second, the second turned me over to an office boy on roller skates. The office boy was a speedy convoy. In less time than it takes to tell it, I was signing my name to a pink tag and a white card—a mere formality, but for the convenience of the coroner, no doubt. Then there was another walk—this time a brisk one under escort—through the factory.



"'Is this the man?' one of them called. Apparently 'this' was, for . . . one man pulled off my overcoat and another momentarily blindfolded me with a knitted helmet, then a leather one, and lastly goggles."

As we emerged from the doorway of a vacant hangar and stepped into the field, a yellow De Haviland plane, a few yards ahead, faced us. About it were grouped several men. Two of them, in the one-piece khaki togs of helpers, ran forward.

"Is this the man?" one of them called. Apparently "this" was, for while I turned to my escort for verification, one man pulled off my overcoat and hat, while the second momentarily blindfolded me with a knitted helmet, then a leather one, and lastly a pair of goggles. While the latter were being adjusted, a warmly lined leather coat was hung in place and buttoned tightly.



"The pilot stepped forward with hand extended. It was much like getting into a prize ring and shaking gloves with Jess Willard."

The pilot stepped forward with hand extended. It was much like getting into a prize ring by accident and shaking gloves with Jess Willard. There are two toe holes in the fuselage of a De Haviland that afford access from the ground. They were used, and presently, ensconced in the heavily upholstered rear seat, I was securely strapped in place.

The instrument board, with its eight or nine dials, was before me. Likewise there were the "joy stick" and foot bar, for the machine had dual control. Forward, atop the fuselage, was a small, transparent cowl.

The onlookers scattered. The pilot swung into his place ahead, and in a moment the stick and foot bar began moving.

"Ailerons," said the pilot.

"All right," came the reply from the ground.

"Elevator."

"All right."

"Rudder."

"All right."

"Turn her over."

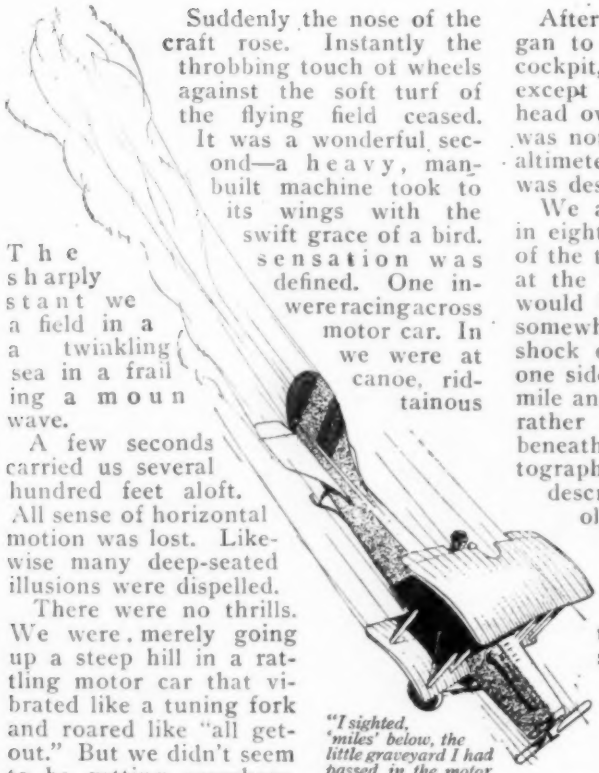
With that the big 12-cylinder Liberty motor gave a snort that grew into a roaring purr. Gasoline perfumed the air that rushed rearward in powerful currents. In a moment, the motor warmed, the pilot began to open the throttle wider. The right wing was released and the tip of the left one held back, causing the plane to swing at right angles to the hangar as it got under way.

We were off. The roar of the engine grew intense. The plane trembled. The ground, covered with dead turf, looked like yellow matting as the machine swept across it, gaining speed each inch it traveled.

Suddenly the nose of the craft rose. Instantly the throbbing touch of wheels against the soft turf of the flying field ceased. It was a wonderful second—a heavy, man-built machine took to its wings with the swift grace of a bird. The sensation was sharply defined. One instant we were racing across a field in a motor car. In a twinkling we were at sea in a frail canoe, riding a mountainous wave.

A few seconds carried us several hundred feet aloft. All sense of horizontal motion was lost. Likewise many deep-seated illusions were dispelled.

There were no thrills. We were merely going up a steep hill in a rattling motor car that vibrated like a tuning fork and roared like "all get-out." But we didn't seem to be getting anywhere. There was no sense of motion, except that of continual turning and corklike bobbing as the craft climbed. Those who shun motor cars because they fear speed, should take up aviation. To travel a hundred miles an hour in the air is no more exciting than sitting in a rocking chair in a machine shop.



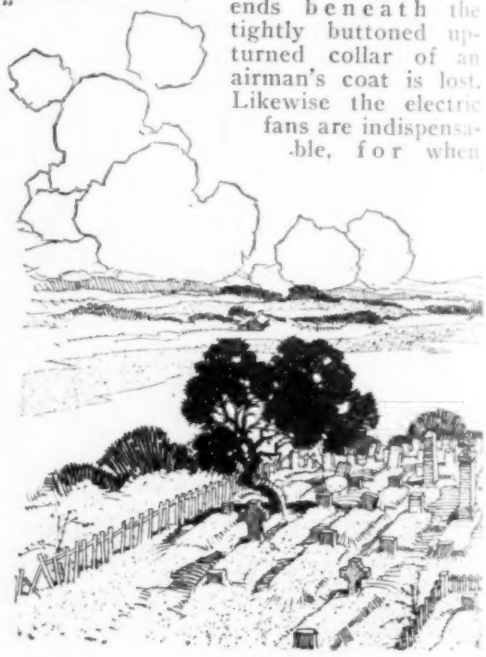
"I sighted, 'miles' below, the little graveyard I had passed in the motor car. . . . The pilot suddenly pointed the nose of the ship straight down. . . . Down we shot, straight as a plumb line. . . . Up came the cemetery to meet us half-way."

I had expected a certain buoyant exhilaration. I had it all settled in my mind that I would feel decidedly birdlike and skim through the air as if swimming in space. And "swimming in space," I half feared, might have the disastrous effect that always obtains when I cross Lake Michigan in a "terrible storm." Also I harked back to boyhood days and recalled the time I scaled a telephone pole on a bet, looked down at the ground, and all but fainted.

Flying doesn't make one think he has wings. Neither does it make him seasick, nor scare him to death by taking him to "dizzy" heights. In fact, straight flying is as nearly devoid of unusual sensations as anything possibly could be. It even lacks the thrills that make children relish swinging on a rope—and other "first-flighters" agree with me in this.

After a few minutes of climbing, I began to be bored. Strapped in the rear cockpit, unable even to see the pilot ahead except on occasions when he thrust his head over the side of the fuselage, there was nothing to do except look up at the altimeter or down at the earth. Variety was desirable, so I did both.

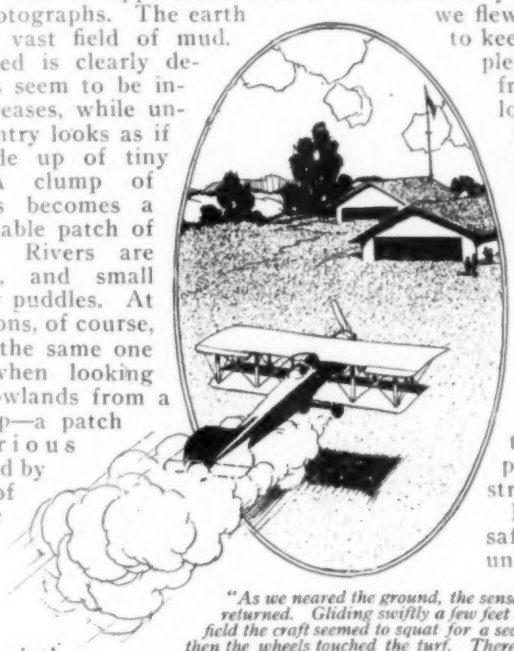
We attained an elevation of 8,500 ft. in eight or nine minutes of flight. Most of the time was spent in looking sidewise at the horizon and wondering when we would begin to fly horizontally and get somewhere. Therefore it was with a shock of surprise that, upon leaning to one side and looking straight down for a mile and a half, I discovered a large city, rather than open country, immediately beneath us. In these days of aerial photography, it hardly behooves a writer to describe the chimney pots of a metropolis, or the appearance of the earth itself, as seen from a vantage point. Bandage your neck until it is immovable, climb on top of a piano, allow 100 electric fans to blow in your face, squint at a relief map on the floor, and you obtain a fair representation of what one sees and how one feels when looking down from far aloft. It is necessary to bind the neck, else the effect of wearing two helmets with ends beneath the tightly buttoned upturned collar of an airman's coat is lost. Likewise the electric fans are indispensable, for when



one's head is not directly protected by the cowl, the rush of air pulls his hair—helmets notwithstanding—and plays havoc with his eyelids, despite goggles.

In wintertime, however, open country from the sky has an appearance that is missed in photographs. The earth looks like a vast field of mud. The watershed is clearly defined. Bluffs seem to be insignificant creases, while undulating country looks as if it were made up of tiny mounds. A clump of leafless trees becomes a barely noticeable patch of low brush. Rivers are mere seams, and small lakes shallow puddles. At lower elevations, of course, the scene is the same one obtains when looking across the lowlands from a mountain top—a patch quilt of various shades seamed by a jumble of threadlike highways, crossing at all angles.

For years past, many have conceived the so-called millennium as a future time when aeroplanes would be as common as motor cars, and fliers would land on housetops and in streets and country roads. Already successful landings have been made in city thoroughfares and rural highways, and one descent has been made on the roof of a business building. But to the landlubber who goes aloft for the first time, reaches a height of a mile and a half, and looks down, such "pocket-handkerchief" landings seem absolutely impossible of accomplishment, for the roof of a large building appears no greater in area than one's thumb nail, and a street or a road looks no wider than a crack in a hardwood floor. Miraculous marksmanship would be required, the novice thinks, to bring a plane anywhere near such places—in fact no specified spot smaller than the Sahara Desert itself could be hit except by the rarest of accidents. In other words, the smallness of everything as viewed from a distance, produces a marked impression, when the thought of landing is considered. The tyro, however, fails to realize that a pilot doesn't actually begin to land until his machine is within 200 ft., or so, of the ground, from which height normal vision is afforded.



"As we neared the ground, the sense of speed returned. Gliding swiftly a few feet above the field the craft seemed to squat for a second, and then the wheels touched the turf. There was one soft bounce, and we rolled toward the hangar and into it."

All of these things flashed through my mind as we sailed along, high above field and streams, housetops and city streets. Unfamiliarity with the district over which we flew made it impossible for me to keep my bearings. I was completely bewildered. The field from which we ascended was lost in the maze of other fields a minute after we left the ground.

It was like riding in a train and suddenly coming in view of one's home town after years of absence, therefore, when I sighted, "miles" below, the little graveyard that I had previously passed in the motor car. As I gazed upon it, fascinated for some queer reason, the pilot suddenly throttled the engine and pointed the nose of the ship straight down.

Instantly I wondered if the safety strap could have come unbuckled. Down we shot, as straight as a plumb line, and fully as fast as Mr. Newton's law of gravity could pull us. Up came the cemetery to meet us halfway.

The first split second produced a "sort of sensation." The change in direction had not been anticipated. Furthermore, I wasn't exactly sitting on anything except my face. I wanted to take hold of something. I didn't want the plane to leave me behind. And yet I couldn't shift my eyes from the cemetery long enough to look for a handhold, and I feared that in feeling for one I might grab the "joy stick," so I gave it up and watched the tombstones travel skyward.

Down we went for 2,500 ft.—as I afterward learned—in an intoxicating dive. At last flying, more literally, falling, was exhilarating. All was dead quiet, except for the rush of the air, and there was no vibration. This was "swimming in space!"

Suddenly the silence was broken. The motor burst into a roar. The "joy stick" was centered, ending our fall. The plane curved sharply, mounting as if to loop. The engine was throttled, as, nose up and half on its back, the craft was thrown on its side by a quick kick of the rudder. Again the motor roared, and down we dipped, reaching the normal line of flight

on an even keel at full speed. All of this happened in a second. It produced seven distinct stomach motions. The pilot had done the "Immelman turn," known to French fliers as "reversement," a "stunt" much used in battle, but not necessarily done as the aftermath of a nose dive. I was revising my opinions of flying—after all it was not without thrills.

Traveling full speed ahead, the ship suddenly shot upward and began to stall. Then it whirled with a spiral motion, turned over on its back, slid on one wing, and plunged down, straightening out at length, and resuming its original direction. I wasn't quite sure what we had done, but I guessed it was a "vrille," and correctly, chiefly because it had made me feel like a human whirligig. After the long dive and the Immelman turn, however, I was, in a sense at least, prepared to enjoy this, and the subsequent flip-flops.

Finally, from an altitude of perhaps 3,000 ft., the machine began to descend in a steep spiral. Then, straightening out, banking two or three times between short glides, the craft approached the landing field at a height of perhaps 200 feet.

As we neared the ground, the sense of speed returned. Gliding swiftly a few feet above the field with motor throttled, the craft seemed to squat for a second, and then the wheels touched the turf. There was one soft bounce, and we rolled toward the hangar and into it.

The pilot climbed to his feet.

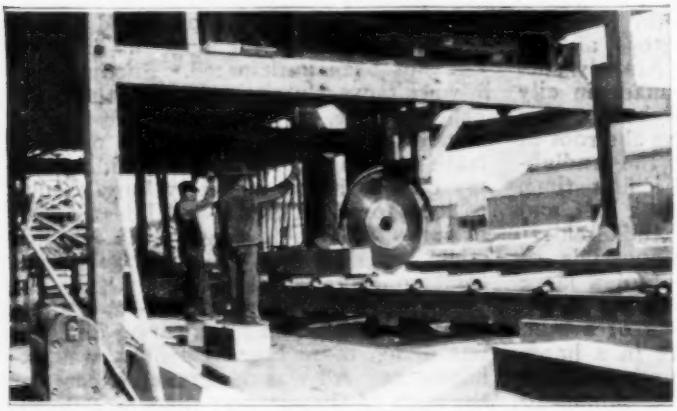
"How far did we drop in that nose dive?" I asked.

He replied, but I merely saw his lips move. Taking off goggles and headgear, I discovered my ears were ringing as if filled with water. They continued to do so for an hour.

The drive back to the city was very ordinary. I didn't even notice the cemetery.

BIG-TIMBER SAW ON ROLLERS CUTS AT ALL ANGLES

A big circular saw suspended from a rolling platform, instead of swung like a pendulum, is an improvement devised by a western shipyard foreman. The platform acts also as a turntable, allowing a cut at any angle. A lining edge tells the workman when the saw angle matches the cutting mark on the timber, the carriage being turned with a handwheel. Using a 16-ft. track and a 48-in. saw, timbers from 19 in. to 7½ ft. wide are cut straight through, leaving cleaner edges than the old swinging cut. The one saw keeps two tables busy, the carriage being rolled from one to the other. In an eight-hour day two men can cut 50,000 ft. of ship timber.



Shipyard Circular Saw Hung from a Rolling Platform Instead of a Swinging Arm, Thereby Making a Straight Cut of Great Length and Uniform Depth: The Carriage Also Turns to Cut at Any Angle

ASTRONOMER ADVOCATES ONE TIME FOR UNITED STATES

As a remedy for the complexity of the present system, an astronomer now proposes that there be but one time for the entire United States. He calls childish the assumption that people are slaves to their clocks; he suggests instead that they rise early or late despite the time shown by their timepieces. In detail, he would have all the clocks in the United States show the same hour, regulating the time of legal noon, however, by solar time. Thus, in the East, legal noon would fall at 10:30 a. m., and business would begin an hour and a half earlier than at present; in the far West it would fall at 2:00 p. m., and so on. A transcontinental traveler would never alter his watch; he would simply learn at what time local business commences. The same scientist also advocates numbering the hours of the day continuously from midnight to midnight, abolishing the present system entirely.

The Traveling School for Negroes is Seen Above, Holding Its Class in Cream Separating and Butter Making. Men and Women are Equally Interested in This Subject, and All the Demonstrators in the Truck Take a Hand

How to Make a Fireless Cooker Out of a Lard Tub, and the Proper Way to Weave Rag Rugs and Shuck Mats, Are the Absorbing Topics Presented to the Exclusive Class of Women in the Picture Above. The Men's Class, on the Right, is Learning How to Treat Oats for Smut. Later They will be Told How to Spray Peach Trees, Build Fences, Take Care of Live Stock, and Use Concrete. The Demonstrators, Also Colored, Wear Farmers' Working Clothes

FARM SCHOOL IN MOTOR TRUCK VISITS NEGRO DISTRICTS

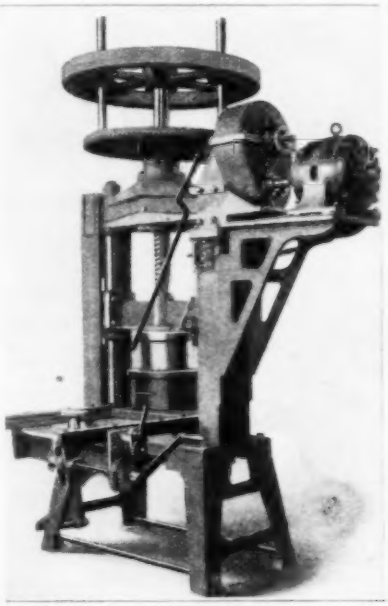
Five men who know their subject can pack a surprisingly large amount of instructional material into a small motor truck. In Alabama, such a truck is engaged in the work of teaching better farming methods to the negroes in hitherto inaccessible districts. Home economics for the women is taught simultaneously in the same manner. Everything, from insect extermination to concrete construction, and from making rugs to caring for children, is included. A state school and the Department of Agriculture are behind the undertaking.

AIRPLANE LINE TO FAMOUS SWISS MOUNTAIN RESORT

Wealthy tourists to St. Moritz, the world-famous Swiss winter and summer resort, may soon be able to make the trip from Zurich in one hour, instead of the seven or eight now required by the railroad. Capitalized at about $100,000, a company has been formed to back the 90-mile airplane line, and has already announced that service will be inaugurated during the year with tickets selling at about $100. Many will doubtless be willing to pay this price, if for nothing but the matchless view of mountains, lakes, and glaciers.

ELECTRIC PRESS MAKES CLAY BOXES FOR POTTERS

Pottery ware which is to be subjected to kiln fire is placed in rough clay boxes, called "seggars." Ordinarily made by hand, these articles can now be turned out by an electrically driven press, which increases the capacity of a man and helper about tenfold. The operator places a piece of plastic clay in the mold, pushes it under the press, and moves the lever forward. The screw brings the top plunger down, and presses the seggar; after which the machine reverses itself and comes to a stop at the proper height. Pulling the mold back, the operator pushes out the seggar by means of the geared ejector. The helper carries the finished product to the drying room, from which it is delivered ready for use.



Clay Boxes, Known as "Seggars," are Fashioned by This Electric Press. It Is Simple in Operation and Free from Danger, Yet Increases the Operator's Efficiency by 1,000 Per Cent

Two men could make by hand about 60 or 70 seggars, but it is claimed that with this machine the output may go as high as 1,000 a day. Much coarser materials may be used than with the hand presses.

GREAT STADIUM TO BE GIVEN TO FRENCH

On the completion of the interallied games in June, General Pershing will present to the French government the keys to "Pershing Stadium," built by the coöperative effort of the French and American armies and the Y. M. C. A. Situated not far from Paris, the stadium will hold 62,000 spectators within its concrete walls, besides the field itself, which has a 200-meter straightaway and a 500-meter elliptical track, inclosing the football field in the center.

CHINESE BUSINESS MEN SUPPORT SCHOOL

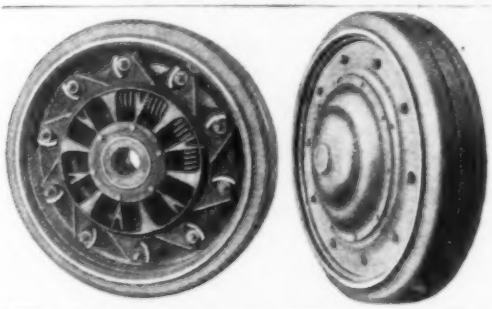
Chinese business men of Victoria, B. C., maintain a free school for children of their own race, which began with 40 pupils in 1899, and now boasts an enrollment of 200, instructed in both English and Chinese by a staff of six teachers. It is the desire of trustees and faculty that the children be trained, not only as

These Chinese-American School Children Attend a School of Their Own, and on the Occasion of the Photograph were Celebrating the Birth of the Sage Confucius. Standing before the School at the Right Are Two Pupils Who will Return to China to Complete Their Education

worthy citizens of the Dominion in which they live, but also as pioneers who shall some day return to their native land to assist in its development. The work has had the endorsement of the last two Chinese ministers of education, as well as of the president of China, who lately presented the school with five hundred dollars.

SPRING-FLOATED TRUCK WHEEL IS ADJUSTABLY RESILIENT

A resilient motor-truck wheel, containing 12 springs, which all work together instead of separately as when spring spokes are used, is the invention of an Ohio man. The rim has 10 inwardly projecting lugs, with a roller on each to reduce friction. Ten hook-shaped teeth on a floating spider push against the rollers in the forward-driving direction, and an exactly similar spider, reversed, engages them in the opposite direction. The 12 springs are arranged about the inner periphery of the hollow hub, compressed between spokes attached to the spiders and spokes fixed to the axle. When the wheel encounters a bump, the spiders



As Seen at the Left, Springs in This Resilient Wheel are Arranged Circularly Instead of Radially. The Complete Wheel is Shown in the Right-Hand View

tend to rotate in opposite directions against the springs, producing a uniform, resilient resistance. Breakage, or intentional removal, of some of the springs merely reduces the total spring tension and does not unbalance the resilient effect.

AIRSHIP MODEL EMPLOYS UNUSUAL PRINCIPLE

Great things are claimed for the finished machine by the inventor of the small model airship illustrated. In demonstration, he suspends it from a counterbalanced arm; switches current into the electric motor through a long wire; the propellers revolve and the machine rises. His secret is found in the collar which grasps

Swung from a Counterbalanced Arm This Air Machine Drives Itself in Any Desired Direction

the shaft of each propeller. Given an up-and-down motion by the eccentric ball bearing, which is indicated in the photograph by an arrow, the collar communicates a "feathering" motion to the propeller through the helical slots in the shaft. By altering the relative position of this eccentric he secures movement in any desired direction.

HOW OILCLOTH HELPED FIGHT THE INFLUENZA

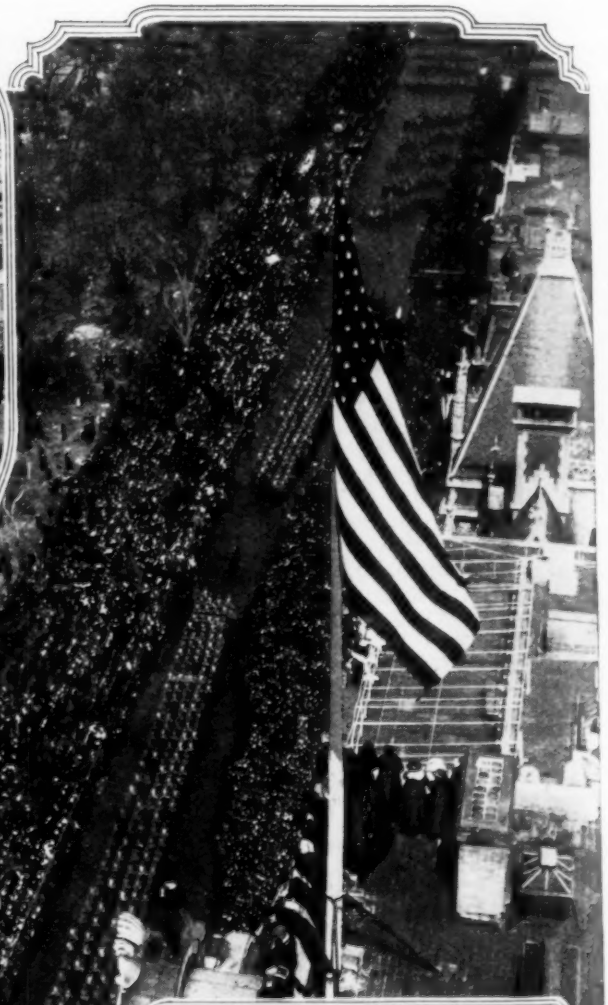
During the worst of the influenza trouble, upright strips of white oilcloth were stretched down the center of each long mess table at certain army posts. They made conversation across the table rather difficult, but everyone realized their worth in checking contagion.

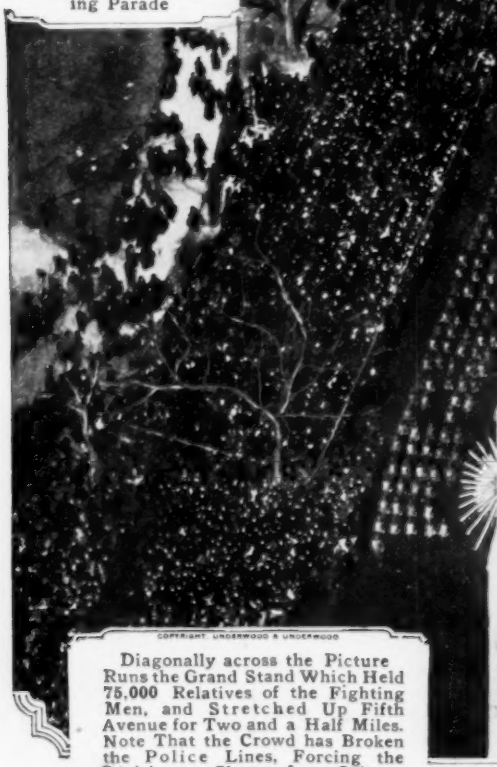
These Long Strips of Glistening Oilcloth Minimized the Spread of Influenza in Army Mess Halls

NEW YORK'S MILLIONS GREET VETERAN OVERSEAS

COPYRIGHT UNDERWOOD & UNDERWOOD

This White, Silken Banner, with Its 1,972 Gold Stars for the Comrades Left Behind, was Carried at the Head of the 27th Division's Homecoming Parade





COPYRIGHT UNDERWOOD & UNDERWOOD

Diagonally across the Picture Runs the Grand Stand Which Held 75,000 Relatives of the Fighting Men, and Stretched Up Fifth Avenue for Two and a Half Miles. Note That the Crowd has Broken the Police Lines, Forcing the Division to Change from Column of Platoons to Column of Squads

At Night Powerful Searchlights were Flashed on This "Arch of Jewels," from Which Hung Thousands of Colored-Glass Prisms. The Arch Expressed Joy and Thanksgiving

DIVISION IN GREATEST PARADE CITY EVER SAW

Even against This Fifth Avenue Church a Grand Stand was Built for the Spectators Who Applauded the 20,000 Veterans of the Drives That Broke the Hindenburg Line and Started the Germans on Their Last Retreat

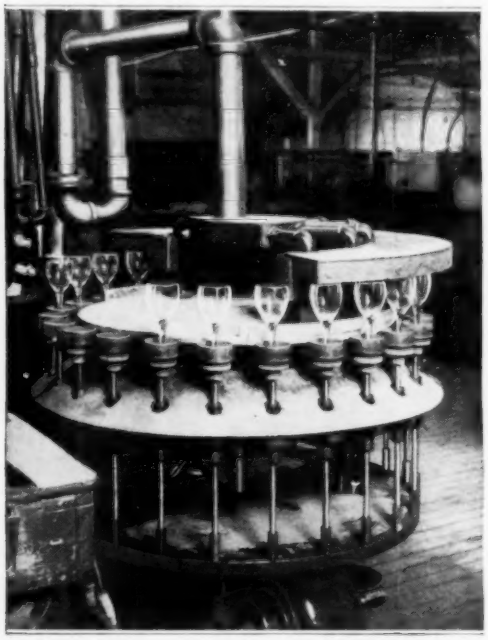
The Swaying Balloons with Dangling Pennants Which Tugged at the Ribbons, Anchoring Them to the White Columns of the Victory Arch, Gave an Air of Dreamlike Unreality to the Scene. The Columns were Linked Together with Green Garlands

COPYRIGHT UNDERWOOD & UNDERWOOD

At 23rd Street, the Division Passed through the "Victory Arch," the Most Elaborate Decoration on the Line of March. Four Captive Balloons Swayed from Pylons on Either Side of the Roadway, and Airplanes Flew Overhead. The Huge Crowd Filled Every Window, and at This Point Was Almost Unmanageable

MACHINE ROUNDS EDGES OF THIN TUMBLERS

After thin tumblers, or drinking glasses, are blown, the upper ends are scored,



The Machine Pictured Passes the Edges of Thin Tumblers before a Flame, Each Tumbler Revolving Separately

heated, and cracked off to shape. Grinding then reduces any jagged roughness, leaving, however, sharp edges that would certainly cut the mouth. Consequently the tumbler tops are last subjected to a flame which melts the edges to a final smoothness. This final process has formerly been done by hand; but a revolving table has now been devised upon which a score of upright chucks revolve independently, carrying the tumbler edges past a semicircle of horizontal flame. Two girls operate the machine, one feeding it rough tumblers, the other transferring the finished articles to a conveyor.

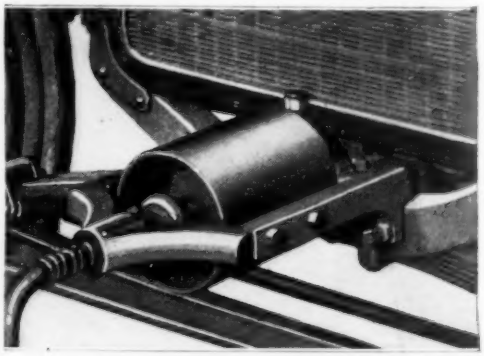
RADIO ANTENNA OF NEW FORM CURES STATIC TROUBLE

Details of the method by which wireless telegraphy or telephony is cured of its greatest affliction, static trouble, as announced in Popular Mechanics last February, are now made public. The atmospheric electrical disturbances responsible for static phenomena are found to possess distinctive characteristics, in that their vibrations are propagated in a plane at right angles to that of the radio-message waves. Available message waves reach the receiving station only in a horizontal plane. Natural variations of potential between the earth and higher atmospheric strata, on the other hand, pass through the receiving antennæ in a vertical direction.

By substituting for the usual tower of wires an alined pair of rectangular wire loops near the ground, the aerial disturbances are forced to affect both loops simultaneously. By differential operation these two charges are nullified. In message reception, however, the two loops are not electrically in phase, because the horizontal impulses reach the loop nearest the transmitting station first. It is a simple matter to combine and make use of these now unhampered waves. The result is that static is eliminated, a simpler form of antenna made effective, and a new element of directional selection introduced.

PULLEY CLAMPED TO MOTOR CAR HAS MANY USES

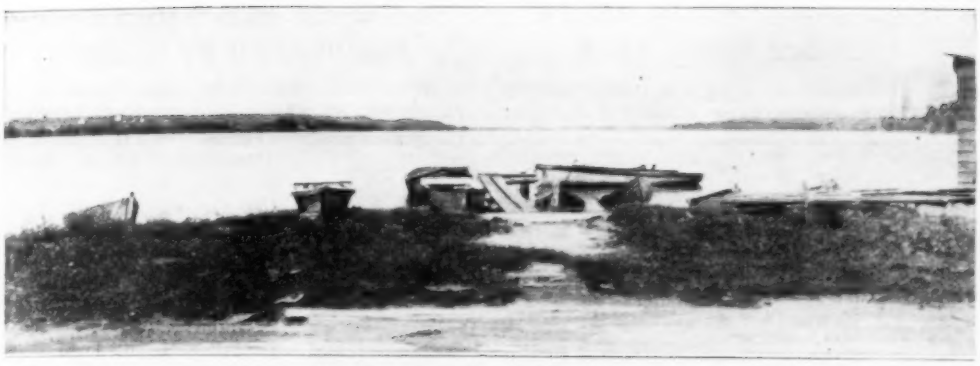
An attachment for a well-known small-priced car that should interest the farmer is a 6-in. drive pulley which clamps to the frame in front of the motor. Developing from 8 to 10 horsepower, it should run any of the light machines about a country home—power saw, feed grinder, concrete mixer, or washing machine. A ball-and-socket bearing in-



This Auxiliary Power Plant Is Always Ready When Needed, Yet does Not Interfere with the Driving Qualities of the Car

troduced immediately under the oil cup compensates for possible poor alinement.

¶ Children's playgrounds, that will serve both to emphasize the blessings of peace and to memorialize those who died to attain it, are suggested for all the large Canadian cities.



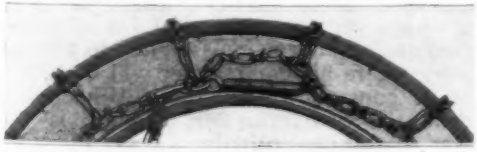
Lake of 200 Acres Formed by the Escaped Water of a Gushing Well on a North Dakota Farm: By Renting Rowboats to Duck Hunters and Other Pleasure Seekers, and Selling Shore Lots to City People, the Farmer is Making Bigger Profits Than He Ever Realized from the Crops Which were Drowned by the Runaway Well

RUNAWAY WELL MAKES LAKE: FARMER MAKES PROFIT

Here is the story of a farmer, in drought-stricken North Dakota, who asked for a well and received a lake. And when he bemoaned the lake because it robbed him of 200 acres of his best land, it began to return him a larger profit than the crops it displaced. The well drillers had to go down 2,300 ft. before they struck water in that arid region. But when they did strike it, the drill rods shot from the ground, and the escaped water gushed and surged into all the hollows on the farm. Lakes were scarce in that section. It was quite a curiosity to the neighbors—and, also, to the wild ducks, which promptly discovered the new swimming hole. So the farmer, despoiled of his crops, planted a fleet of rowboats, and turned some acres into building lots for city folk.

SPRINGS ON TIRE CHAINS PREVENT FLAPPING

The familiar rainy-day "click-click-click," as loose tire chains slap against auto fenders, is stopped by applying a simple coil spring, recently patented, to each wheel chain. Springs for that purpose are now a recognized commodity. Once on, they remain a part of the chains, which then always hug the tire and yet are loose enough to creep as they should.



One Small Coil Spring Like This Attached to Each Tire Chain Holds It Snugly against the Tire

MOWER FOR GOLF GROUNDS HAS CORRUGATED BLADES

Lawn mowers of the familiar form, with slanting blades, often slide the tougher stalks of grass sideways instead of

The Corrugated Blades of This Lawn Mower Prevent Tough Stalks of Grass from Slipping Sideways and Escaping

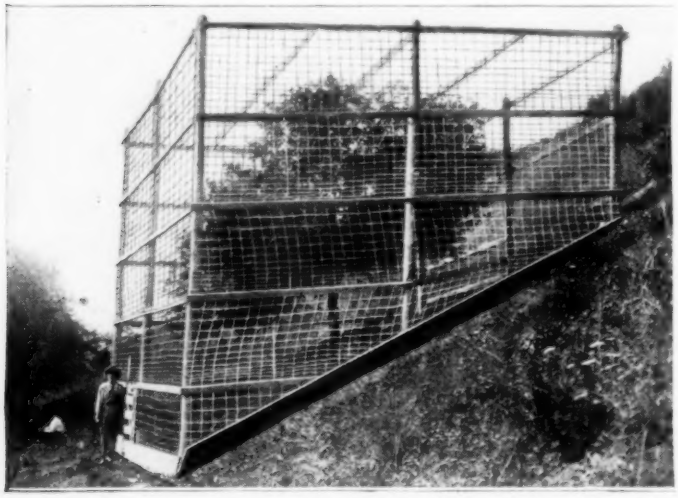
cutting them. A Pennsylvania inventor overcomes this fault by the simple means of substituting corrugated blades for the straight ones. The grass, caught in the recesses, cannot escape and is instantly decapitated. The remarkably clean, close work of this machine recommends it for such particular tasks as mowing golf links.

TRACTOR PULLS TRAILER DOWN LONG HOSPITAL CORRIDORS

A great army reconstruction hospital is divided into so many wards that transportation of the wounded within the building becomes a problem in itself. It has been solved in one institution, however, where an electric tractor quietly hauls a smooth-running trailer bearing 10 disabled soldiers up and down the long corridors. With careful operation the many trips are made without a jolt or jar to cause discomfort to the patients.

CAGE AND BURGLAR ALARM PROTECT APPLE TREE

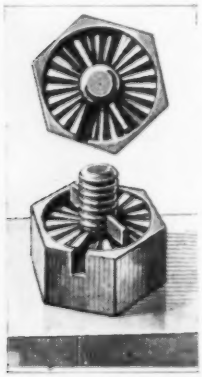
When a West Virginia mountaineer sent three apples to a Missouri nursery firm they were found to have a new and delicious flavor. The negotiations that followed resulted in $5,000 being exchanged for a seedling that is now almost 20 ft. tall, and so highly valued that a substantial cage, fitted with a burglar alarm, makes trespassing impossible.



Five Thousand Dollars was Paid for This Apple Tree. It is Now Considered So Precious That Every Precaution is Taken against Trespassers

NUT LOCKS FIRMLY ON BOLT BUT IS EASILY REMOVED

A novel kind of lock nut, which cannot be accidentally loosened on the bolt, but is readily removed with a wrench, has been designed by a woman inventor. A recess in the top of the nut is shaped at the bottom like a shallow spiral stairway. The nut is turned onto the bolt, and a short cotter pin is inserted through a slot in the bolt. Tightening the nut engages the pin with the notches or "stairs" of the recess, which position it holds until forcibly disengaged. With the cotter pin removed it acts as an ordinary nut.



"SIGNS" OF OLD-TIME FARMER VINDICATED BY SCIENCE

New-fashioned folk who have been laughing at the old-fashioned farmer's "signs" had better straighten their faces. Science, represented by the Department of Agriculture, not only sanctions much of the agriculturalist's dependence on common phenomena of nature, but is actually plotting a kind of "nature's index" based on the same kind of observations. To take a homely example, the farmer is likely to rush his late harvesting when the cockleburs start to ripen, and to plant his winter wheat between the late bloom of the tall goldenrod and the turning of the hickory leaves. When these indeterminate events vary from year to year, he varies his planting and harvest days to agree with them. And now the scientists tell him he is right in that practice, and not only to keep it up but to add to it. What is more, they intend to help him. A catalogue of "index plants" and signs is being prepared which correlates all these orderly activities of nature. Based on a study of seasonal sequences covering many years, it reduces the significance of its records to absolute mathematics, and announces their meaning in terms as simple as the farmer's own expression of the old-time beliefs.

NAVY RECRUITS GET OUTFITS WHEN FOUND MENTALLY FIT

Mental defectives were formerly discovered in the navy only after some weeks of training and much valuable equipment had been wasted upon them. This is no more the case, however, at a large inland training station, where the recruit is now psychologically examined immediately on entering the service. If found wanting he is either sent to a hospital for observation and discharge, or assigned to a company where his commander will keep him under constant surveillance. What gladdens the quartermaster, though, is the fact that the recruit doesn't get his suits until he has proved he can make good.

CENSUS OF WILD ANIMALS

By W. F. WILCOX

WHILE the government takes a census every ten years of its human beings, it does not forget its wild inhabitants. The district forester of Colorado has made a report on the wild animals in the state on the national forest reserves, which presents some rather startling figures.

Since 1913, 325 head of elk have been brought from the Yellowstone Park region to the mountains of Colorado. There has been a constant increase of this herd until now there are over 5,000 elk in Colorado. In the year 1917-18, the increase was 480 animals.

A four years' closed hunting season resulted in an increase in deer, although not so considerable as is desirable, on account of the depredations of coyotes and mountain lions, hundreds of deer being killed each year by predatory wild animals. There are now some 23,000 deer on the national forests of the state. Although antelope are protected by law, their number is practically stationary. Only a few of these animals remain in the state, the number being 45 for 1918. There are 43 white-tailed deer in the state and 22,642 mule deer. The latter decreased somewhat in 1918, as there were three days of hunting and about 1,100 were killed during this time.

Mountain sheep are slowly and steadily decreasing in number, principally because of loss from wild animals, but also, perhaps, because domestic stock has encroached upon ranges formerly occupied by this game. Mountain sheep decreased from 7,435, in 1917, to 7,123, in 1918.

Each Wildcat Has a $50 Share in Colorado's Annual $1,000,000 Loss from Predatory Animals

Beaver are increasing rapidly. In 1917, there were, according to estimates, 12,914 on the forest reserves, and, in 1918, 22,642.

To Preserve Game and Stock, a Bitter Campaign is Waged in Colorado against Wolves and Coyotes. This Dejected Wolf has Dragged His Trap until Exhausted and Now Seems to Realize What's Coming to Him

Bears are becoming very scarce. There are estimated to be 2,176 black and brown bears in the state, against 2,141 in 1917. Silver-tip bears decreased from 143, in 1917, to 79, in 1918.

Mountain and willow grouse are not materially increasing. The sage hen is on the decrease. The ptarmigan is stationary. Some predatory animals are on the increase. Coyotes in the national forests increased from the 1917 estimate of 23,320 to 24,895, in 1918. Lynx and bobcats decreased from 6,473, in 1917, to 6,296, in 1918; mountain lions diminished in numbers from 771 to 674; wolves, from 264 to 258.

It is estimated that in 1917, 2,991 coyotes were killed, and in 1918, 3,967. In 1918, 13 wolves, 32 mountain lions, and 544 wildcats and lynx were killed in the state.

The Careful Count Kept of Colorado's Wild Animals Reveals That Larger Stock Ranges and Predatory Animals are Reducing the Number of Mountain Sheep; but the Herd of Elks, of Which a Few are Shown on the Right, has Grown from 325 Head in 1913 to 5,000 Last Year

BEAUTIFUL BATHING POOL IS BARGAIN IN LUXURY

A private bathing pool, big enough for a park, and provided, indeed, with a veritable park setting, would seem to be an expensive luxury. Yet such a feature on

The Bathhouse Is Simpler Than It Looks. Careful Gardening Is Responsible for the Luxurious Effect

Basin and Fountain Are of Concrete, and Not Nearly So Expensive as They Appear. Here Again the Semblance of Magnificence is Contributed by Gardening and a Pergola Background

a southern California estate, beautiful and impressive as it is, represents in itself an investment of less than $1,000. The basin and ornamental fountain are of concrete. A vine-clad pergola, surrounding the pool, is responsible for much of its effect of magnificence. The four-room bathhouse is simple, but beautified by skillful gardening. The warm-water supply costs nothing, as the pool forms a link in the irrigating system, and a solar heater in the supply line gives just the right temperature.

CHANGES IN SIMPLON TUNNEL SYSTEM OF VENTILATION

Ventilation of a railway tunnel is always a problem, though greatly simplified when the railroad is electric, as in the Simplon tunnel. This double-barreled bore through the Swiss-Italian Alps originally obtained its fresh air from water-driven fans. The installation has been changed to electric drive since the second bore was enlarged. The air ducts, which curve from the fans to the tunnel, are of reinforced concrete, separate for each bore. A modification of the somewhat curious plan originally adopted is now in use. When a train has entered the tunnel, a sliding curtain of sailcloth is lowered behind it, closing the mouth of the bore. The fresh air pumped in then disperses along the direction of the train. It is easier to pump air from north to south than the reverse, because of prevailing barometric differences.

STRAY MINES WILL IMPERIL SAILORS FOR MANY YEARS

Stray mines, estimated to number between 5,000 and 10,000, are known to be afloat in the waters of the Atlantic Ocean and the North Sea. They are a very real danger to the sailor, and will continue to menace him for 20 years, more or less, depending on their watertightness. To comb the seas for them is obviously impossible; yet the danger may be minimized by careful study of charted ocean currents along which the mines will float. Thus a well-known hydrographer has reported to the French Academy of Sciences that mines broken loose from their fastenings in the English Channel will drift southward past France, Spain and Morocco to the Canary Islands, where they will turn westward to the West Indian group. Here

A Better View of the Arrangement of Pergolas, Which Entirely Surround the Pool, Bathhouse and All, and Make a Delightful Green Setting

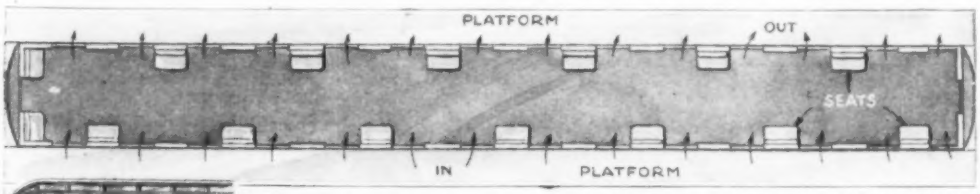
they will scatter, some to drift eastward again toward the Bermudas, the Azores, and the Madeira Islands; some, indeed, to return to the Channel to begin the four-year journey once again. He also states that the coast of the United States is fortunately protected from this peril by the polar currents which sweep southward to the coast of Florida.

DOWNFLOW OF STEAM QUICKENS GAS-RETORT PRODUCTION

In the common gasworks practice of passing steam through the coal for the generation of water gas, it is customary to admit the steam at the bottom of vertical retorts, whence it travels upward with the other products. An English gas engineer, during the last three hours of a 12-hour distillation period, passes the steam downward through the remaining coke and refuse. The top gas outlet being closed, the steam and products issue at the bottom and then enter the base of another retort, moving upward again. With this arrangement a ton of English coal yielded 17,483 cu. ft. of gas of 504 B. t. u., and ammonia liquor equal to 33 lb. of ammonium sulphate—a considerable increase over the usual results.

SPECIAL CARS FOR "SHUTTLE" TRAINS IN GOTHAM SUBWAY

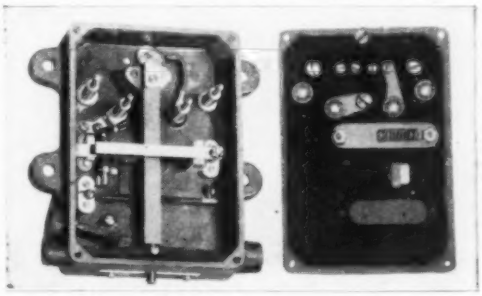
Among the several suggested methods of ameliorating the serious traffic problem that has faced New York since the opening of the Forty-Second Street crosstown subway "shuttle," is the construction of sliding-wall cars that may be loaded and unloaded quickly. At the present time, congestion at the Grand Central terminal during the morning and evening rush hours is unendurable. Therefore it is proposed special cars be used for the "shuttle" trains. Doors, 2½ ft. wide, sliding in stationary wall sections of the same width, would enable one-half of the wall space to be opened on each side of a car. This arrangement would permit a train to discharge passengers from one side and receive them from the other, simultaneously. Obviously such a scheme would not only save time, but also prevent the milling of the crowd. Of course, the plan would necessarily reduce the seating capacity of a car, but this is not considered a drawback, for the distance between the terminals is very short, and "shuttle" passengers would be forced to stand only a moment or two.



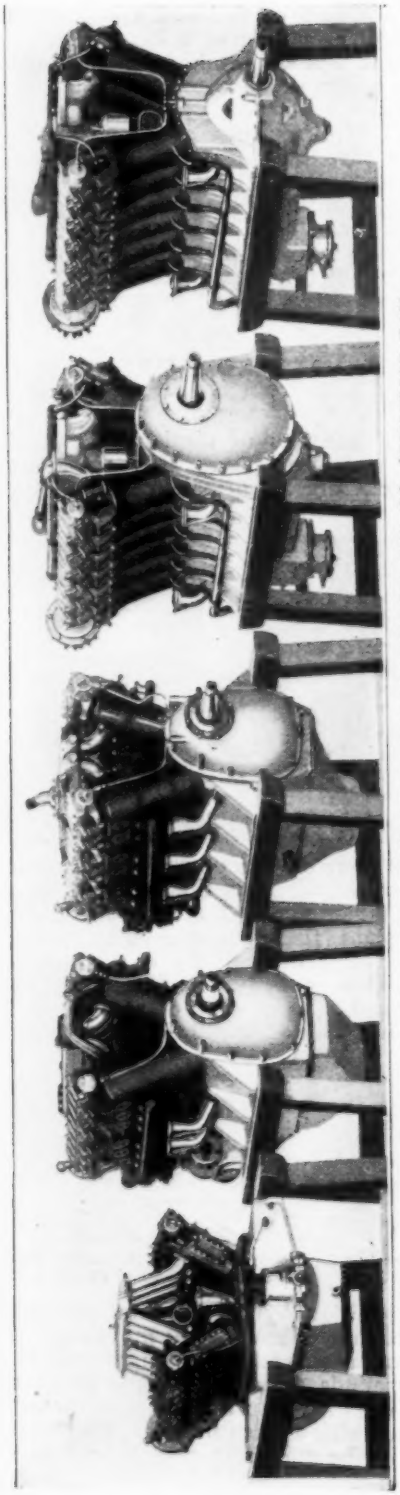
Above Is the Plan of a Subway "Shuttle" Car, with a Series of Doors the Full Length of Each Side. An Idea of the Outside Appearance is Gained at the Left

IGNITION-CIRCUIT BREAKER ADDS TO AIRPLANE SAFETY

Most dangerous of airplane accidents is a broken propeller. It throws the whole structure out of balance before the pilot can shut off the power. An instrument which interrupts the engine's ignition circuit on the first oscillation of the injured plane, therefore, classes as an important safety device. Such an instrument, which is daily demonstrating its value, consists essentially of a metal bar pivoted like a pendulum, held normally in central position by compression springs. When oscillated, however, it moves a pivoted crossbar and releases a trigger, which either grounds or interrupts the ignition circuit, instantly shutting off the motor. It is reset with a push button. The total weight, in the mounting case, is less than 10 ounces.



At the First Lurch of an Injured Airplane, the Lever Swings Over and Breaks the Ignition Circuit



BY COURTESY OF THE PACKARD MAGAZINE

THE LIBERTY MOTOR'S DEVELOPMENT FROM NOVEMBER, 1915, TO ARMISTICE DAY

SEVENTEEN months before America entered the war the Liberty motor existed in embryo. Its forebear was the 12-cylinder engine of auto-racing fame pictured first at the left. With its piston displacement multiplied by three, the next model was built in April, 1916, and a similar model, with all-steel cylinders, came forth just a year later. The original Liberty motor, at the extreme right, developed out of five days' concentrated study of these previous models. The first one was completed July 2, 1917; the final model, fourth from the left, in January, 1918. By November 11 more than 15,000 of them had been made.

COLLEGE OF FISHERIES AT STATE UNIVERSITY

The College of Fisheries, just established by the University of Washington, at Seattle, the busy Pacific fishing center, is the only one in the world aside from the Imperial Fisheries Institute at Tokio, Japan. The four-year course will be offered to the student in three divisions, fishing, technological, and fish-cultural. In the first he will study business management, the history, methods, and laws of fishing, and the construction, operation, and repair of boats and other fishing apparatus. In the technological course he will prepare aquatic products for all sorts of industrial and commercial uses, thus qualifying himself for work in an industrial plant or experimental laboratory. And in the third, the fish-cultural course, the study of the culture and protection of fish will fit him for a position in a government or private hatchery. In addition, like the other departments of a state university, the College of Fisheries will render assistance to state authorities and citizens, will engage in research work, and offer short winter courses to those without time or money for the four-year course.

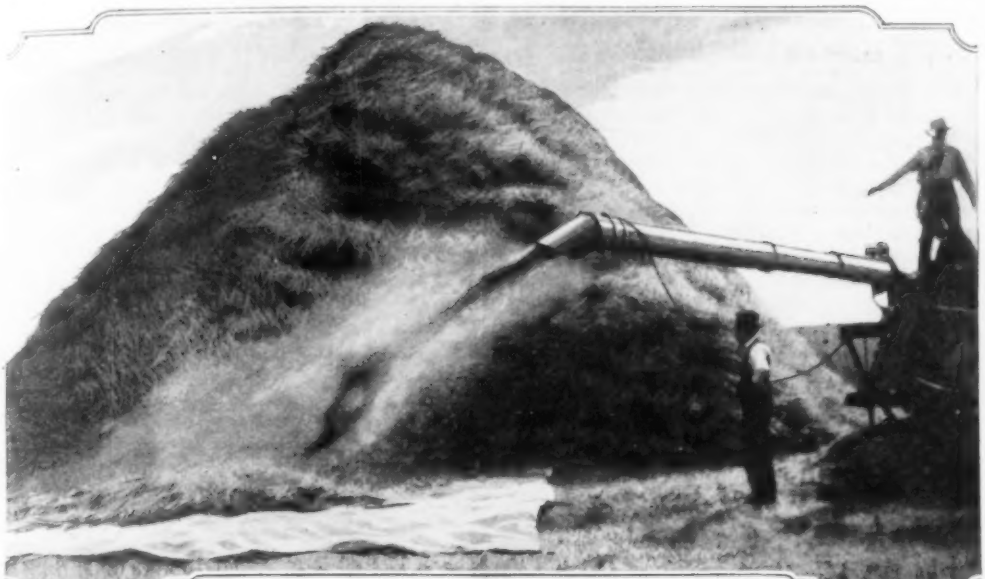
X-RAYS TEST CONCRETE SHIPS FOR HIDDEN DEFECTS

Intrinsic faults of concrete are as obvious to the X-ray as are mere anatomical irregularities. By a process originating on the Pacific coast, a series of radiographs taken during the building of a concrete ship, form a positive check on uniformity and compactness, and allow detection and correction of voids and improper locations of reinforcing before it is too late. The X-ray equipment, which weighs only about 90 lb., may also be usefully employed in studying the hidden effects of service strains on concrete ships which have already faced the sea.

MOSQUITOES GIVEN PLACE IN NATIONAL MUSEUM

Mosquitoes representative of all species found at camps where army troops are stationed are being assembled for display at the Army Medical Museum in Washington, D. C. Besides prescribing most carefully the manner of collection, the order directs that they be shipped to the museum in lots of 25 each.

SAVING WHEAT WASTED BY THRESHING MACHINES



A Cloth Spread on the Ground Receives the Straw Discharged in Threshing Two and a Half Bushels of Wheat. The Man on the Machine Watches the Weighing Device, Which Trips Every Half Bushel

Above: The Big Pile Indicates About Eight Pints of Wheat Wasted. The Small Pile was Produced by the Test After the Machine had been Adjusted. Right: Properly Placed Canvas could have Saved the Wheat on the Ground

Sifting the Straw on the Cloth to Recover the Wheat and Chaff: The Latter is Blown Out Afterwards

Proper Feeding of a Threshing Machine by Pitching the Wheat Evenly, Heads First: The Canvas Underfeeder Is Necessary to Catch Straw, Loose Grain, and Bundles

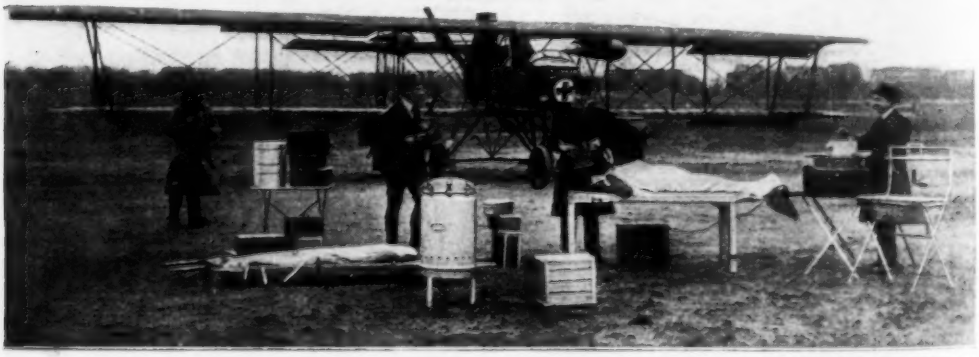
AERIAL AMBULANCE CARRIES HOSPITAL EQUIPMENT

An improved French aerial ambulance is stationed in the outskirts of Paris, where it is reported to outdo its land rival both in speed and in equipment carried. Two large compartments under the lower wing hold a complete emergency hospital outfit, including stretcher and operating table. On arriving at the scene of the accident, the sufferer is thus given the advantage of immediate surgical attention. The operation over, the patient may be stretched out comfortably in the long nacelle and hurried to a city hospital. Among additional features are the powerful landing lights which make night calls possible.

LYONS TRADE FAIR ATTRACTS AMERICAN DISPLAYS

The success of this year's trade fair at Lyons, France, first promoted in 1916 to compete with the famous German fair at Leipzig, has made it an affair of annual international interest. Without government support and handicapped by wartime congestion of shipping and railroads, the fair nevertheless attracted this year nearly 5,000 exhibitors, including many Americans, a substantial gain over the 1,342 of 1916. The exhibits, valued at $4,000,000, were scattered through the city in small booths with an area of 20 sq. yd. and renting for about $115. Next year, however, government support is expected, and work has already begun on a huge permanent structure mentioned in the August, 1918, Popular Mechanics, which will house all the exhibits. The committee has further decided to hold the fair hereafter in two divisions: jewelry, electrical goods, motor cars,

A New Version of Beating the Swords into Plowshares is Offered by This French Night-Bombing Biplane Now Peacefully Doing Civil Ambulance Duty near Paris. In the Picture the Doors have been Lowered to Reveal the Emergency Operating Equipment Tucked Away in the Two Compartments below the Lower Wing



PHOTOS COPYRIGHT, KEYSTONE VIEW CO.

On Finishing the Actual Operation Which They are Simulating Here, the Surgeons would Place the Patient in the Long Nacelle, Pack the Equipment Away in the Two Compartments under the Lower Wing, Step Aboard and Fly Back to the City Hospital

etc., from March 1 to March 15, with metallurgical, industrial, and agricultural machinery, and foreign and colonial exhibits from October 1 to October 15.

COUPLE EXPECT IN TEN YEARS TO WALK AROUND GLOBE

A Canadian couple left last January for a walk which will take about 10 years. Before they return, according to their plans when they left Montreal, they will have traveled clear around the world on foot. Success in this undertaking would make them eligible for a prize offered by a society of authors in Paris, France, the winning of which is one of the objects of their long ramble. The masculine part of this light marching company served at the front with the Canadian Expeditionary Forces, and was discharged after his recovery from a serious wound.

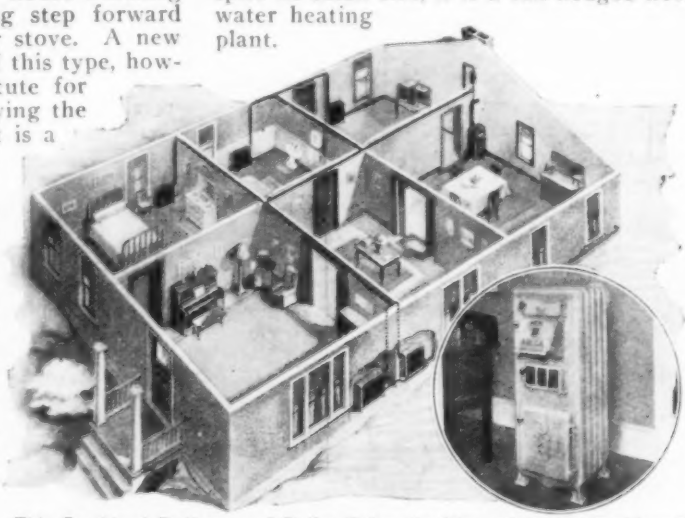
ENTRANCE OF CLASSIC DESIGN LEADS TO PLAYGROUND

An improvement of simple dignity is this retaining wall and stairway, leading from an important thoroughfare to a Washington, D. C., recreation park on a higher level. The stern lines of the masonry will soon be softened by shrubbery and flowers, planted on the terrace which breaks the front of the wall. Practically all the work is of poured concrete, with paneling composed of smooth pebbles.

This Well-Designed Concrete Retaining Wall Is a Welcome Change from the Usual Unsightly Constructions. The Steps Lead from a Washington Boulevard to a Playground on a Higher Level

HOT-WATER HEATING PLANT FOR CELLARLESS HOUSES

Hot-water heat is popularly regarded as the acme of luxury in house-warming arrangements, and a long step forward from the old base-burner stove. A new development in heaters of this type, however, is actually a substitute for the "parlor stove," occupying the same place if desired. It is a combination of boiler and radiator, looking more like the latter. It has the additional advantage over a stove that other radiators, in other rooms, may be connected with it, distributing the heat over any desired floor space. Since no cellar is needed, the new heater appeals particularly to occupants of farm and country houses, and one-story buildings of all kinds. The whole outside surface of the boiler-radiator is water-lined, so it never becomes dangerously hot, and may be enameled any color to harmonize with decorations. It may be installed in any room having a chimney-flue outlet. Despite its small size, it is a full-fledged hot-water heating plant.



This Combined Radiator and Boiler Takes the Place of the Old-Fashioned Stove for Heating Cellarless Buildings. Radiators in Other Rooms may be Connected with It to Distribute the Heat, Making a Complete Hot-Water Heating Plant. It can be Enameled to Match the Decorations

CANADA'S MERCHANT FLEET FLIES NEW FLAG

To fly at the mastheads of her new merchant marine Canada has designed a flag of her own. On a white background

The Background of Canada's New Flag for Her Merchant Fleet Is White. The Cross of St. George Is Blue; the Anchor Gold, and the Beaver Red

appears the cross of St. George in blue, bearing a golden anchor in the center, and inclosing Canada's national animal, the beaver, in the upper left-hand corner. As shipbuilding keeps pace with development of forests, mines, and farms, Canada hopes to fly this flag over Canadian ships in every corner of the world.

MOTORCYCLE USED AS TRACTOR FOR PLOWING HOME GARDEN

Out in California, one ambitious home gardener, denying the right of the big growers to monopolize power farming, hitched a motorcycle to a hand cultivator and finished his 50 by 100-ft. garden in an hour. A long rope and a pulley fastened to a crowbar, driven at the edge of the lot, allowed the motorcyclist to do his tractoring on smooth pavement.

The Motorcycle "Tractor" can Operate at Any Angle to the Hand Cultivator It is Pulling, Because of the Long Rope Connection and the Pulley on the End of the Crowbar. The Latter is Shifted for Each Row

LEAD ELECTRICALLY HARDENED IS NEW BEARING METAL

Out of the war shortage of tin has come a new and successful substitute for babbitt as a bearing metal. It is composed almost wholly of lead, hardened by an electrical process. Its high manufacturing cost is more than compensated for by the low market price of lead compared with tin. The new metal shows a tensile strength of 13,000 lb., the figure for genuine babbitt being 11,000; and an elastic limit of 11,525 lb. as against 10,000 for babbitt. Its friction factor is very low. With a shaft running at 400 r. p. m. and a load of 1,000 lb. per sq. in., 150° was the highest temperature reached by the bearing.

WITH NEW SIGHTS MARINES MAKE HIGH RIFLE SCORES

Everybody "hands it" to the marines for marksmanship, but scores from the Paris Island range suddenly became so very excellent that official suspicion was aroused. Scores were checked and rechecked; the men were even compelled to shoot the course again, with officer observers in the pits and on the firing line. But the scores were as high as before. Only then was it discovered that the reason lay in the new rifle sights used, which had been issued for trial recently.

RAILROAD REORGANIZATION SCHEDULED IN CHILE

Despite the sharp slump in the nitrate market on the cessation of hostilities, the Chilean government has approved an extensive program of railroad reorganization, comprising chiefly a bond issue of 89,000,000 Chilean gold pesos (about $32,500,000). The entire government rail system, which includes most of the national mileage, will be modernized by extensive purchases and by the installation of a block system. It is planned, also, to electrify the section between Valparaiso, the chief seaport, and Santiago, the national capital, a distance of about 60 miles.

Part of the Salvage Department of an Army Camp, Where Everything from Machine Guns to Straw Bedding is Gathered Together, to be Adapted to Further Use or to be Sold: Boxes, Barrels, and Other Containers Form a Large Portion of the Stock, Though It would Be Hard to Name Any Commodity Which is Not Represented. At One Camp the Salvage Corps Consists of a Captain, Five Lieutenants, and 545 Men

SALVAGE OF WAR MATERIAL IS ENORMOUS TASK

One of the busiest places at the army camps just now is the salvage department, where machine guns, rifles, bayonets, blankets, trouser buttons, gas masks, haversacks, belts, shoes and lacings, horseshoes, barrels, wagons, motorcycles, motor trucks, field wagons, mattresses, iron cots and springs, old brass and iron, waste paper, rags, boxes, bottles, etc., are being collected and turned in to be gone over by trained experts and assorted ready for disposal.

The magnitude of the task is illustrated by the fact that at Camp Devens, for instance, one captain, who is salvage officer, five lieutenants, and 545 men are working daily to handle the vast amount of war material. Included in this corps are experts on every kind of material used by our soldiers.

Since the armistice was signed, releasing thousands to civil life, the amount of salvage, of course, has increased many fold. The intent is to dispose of everything in some way, to waste nothing. Even the straw in the men's bedsacks is bringing in money. The sacks are emptied and the straw is piled into huge dumps. Part of it is baled and reissued as bedding for animals. The rest is sold as food for hogs and for mulching.

Metal material that is not worth salvaging is placed in a common dump.

Literally a Junk Pile, Containing Metal Parts and Materials No Longer Useful for Their Original Purposes, But Still Worth Some Kind of a Price: Worn-Out Shovels Constitute a Major Part of This Particular Pile. This Kind of Salvage is All Sold for Cash

Great heaps of old motorcycle bodies, bed springs, cot frames, auto wheels, old rusty stoves, worn-out shovels, and the like, are spread all over the salvage park. But it is all sold, and is paid for before it leaves camp.

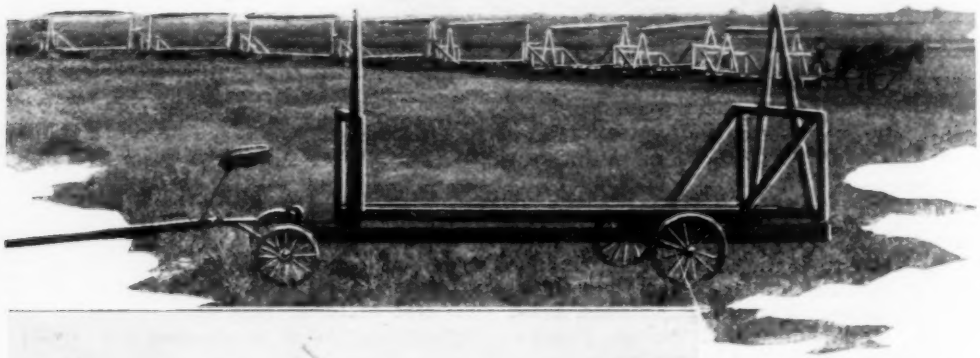
Old hats are baled and sold for felt. Shoes that are in fair condition are repaired, and it is understood that many of them will be sent to Europe for use of civilians in the devastated areas of France, Belgium, and Serbia.

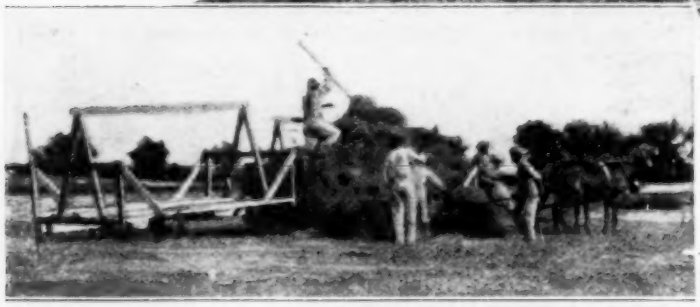
Brass cartridge cases, formerly returned to the munition makers after firing, are now dumped into boxes and barrels, and sold for old brass, while unused cartridges are returned to the arsenals for storage.

Two warehouses are used at Camp Devens for sorting, cutting, and storing clothing and cloth materials. Some of the clothing fit for civilian use, which has never been issued to the men, is being sold to discharged soldiers at cost price.

For nearly every single thing in the American soldiers' equipment some different peace-time use seems to have been found. An exception so far is the gas mask, for there is less to be reclaimed from it than from most other war material. Unfortunately, it has been found that the masks do not lend themselves to industrial uses, so that they cannot be disposed of complete, but there is much material that goes into making of them, such as rubber tubing and sundry metal parts, that will be sold at public auction.

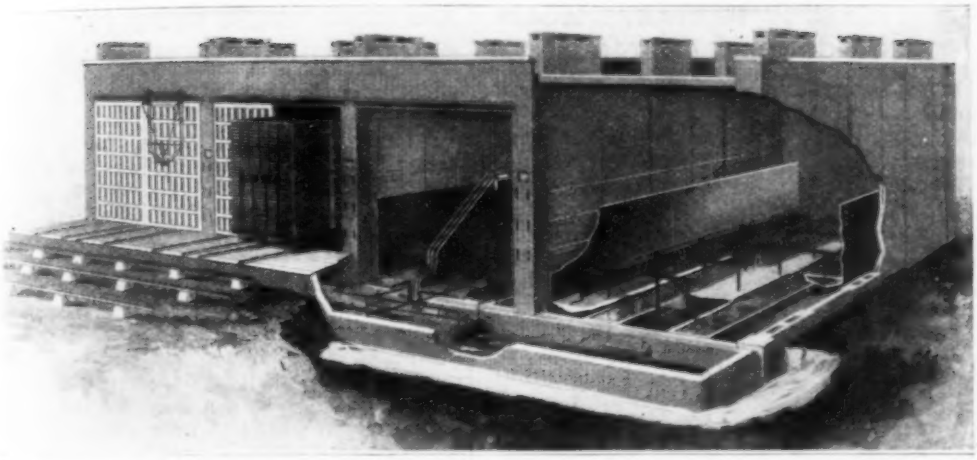
TRUCK METHOD OF CURING HAY SAVES LOSSES





Above Is an Empty Hay-Curing Truck Hitched to a Pair of Wheels for Hauling. At the Left the Process of Loading the Truck is Seen. Below is Pictured a "Town" of Loaded Trucks, with Canvas Covers in Place, Curing Their Hay in the Field

Hay growers in moist climates have trouble in curing their crops. Difficulties of this kind led a Mississippi grower to design a truck on which 1,500 to 2,000 lb. of hay may be cured and expeditiously handled. The truck resembles an ordinary hayrack, except that the usual front wheels are replaced by a pivoted leg or trigger. This, with the rear wheels, supports the truck in the field. A-shaped standards, at front and rear, support a removable ridge pole, over which a can-



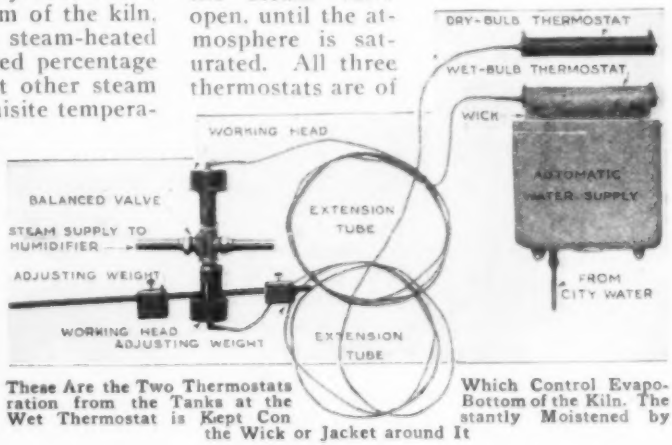
Temperature and Humidity are So Carefully Regulated in This Drying Kiln That Lumber does Not Check and Caseharden from Irregular Drying. Thermostats Automatically Control Heat Supplied by the Steam Coils, and Evaporation from the Water Tanks at the Bottom

vas cover is hung while curing. Hauling is done with a two-wheel running gear coupled to the front, the trigger dragging lightly. A train of several empty trucks may thus be hauled. The process saves labor and prevents spoiling of hay in unfavorable weather.

AIR IN LUMBER-DRYING KILN AUTOMATICALLY ADJUSTED

A lumber-drying kiln has been planned that is claimed to be so sensitive in its adjustment of temperature and humidity that losses from irregular drying and consequent casehardening and checking will be greatly reduced. In a very few words, air is admitted at the bottom of the kiln, is passed over tanks of steam-heated water that give it the desired percentage of moisture, and is led past other steam coils that heat it to the requisite temperature. It then rises through the piles of wet lumber, where it is cooled, and guided down the side walls to the tanks again, thus circulating constantly.

The thermostats which control the warmth and humidity of the air are most interesting, however. To regulate temperature an ordinary thermostat controls flow to the steam coils; but to regulate humidity two are used, to act against each other in a valve and thus govern admission of steam to the vaporization tanks. One thermostat is dry and is affected only by the temperature of the air; the other, being dampened by a wet cloth, registers a lower temperature, due to the cooling effect of evaporation, and hence exerts less pressure on the valve. In consequence, as the air becomes drier, the valve will open, more steam will be admitted to the tanks, and the humidity will rise again. A weighted lever arm controls the relative action of the two forces and hence the relative humidity of the air. Thus, for a desired relative humidity of 100 per cent, the weights of the valve are set in balance, allowing the dry bulb to act against the wet bulb, and hence keep the steam valve open, until the atmosphere is saturated. All three thermostats are of the fluid-containing type in which temperature change produces change in liquid volume and consequent action upon a steam valve.



These Are the Two Thermostats Which Control Evaporation from the Tanks at the Bottom of the Kiln. The Wet Thermostat is Kept Constantly Moistened by the Wick or Jacket around It

AIR PRESSURE PREPARES MOLD FOR CONCRETE PILING

A geyser spouting mud, clay, and stones amid evidences of contemplated construction work probably indicates that the contractor is using the compressed-air method of preparing molds for concrete piling. In this system the molds, consisting of 12 to 15-in. steel pipes, are driven into the soil without closing the lower ends. An air hose is then forced into the upper end of each pipe and water poured in around it to serve as a resisting medium. When air at a pressure of about 110 lb. is turned on, the contents of the pipe immediately leave at the top, often ascending 25 ft. or more into the air. Some of the ejected fragments are as large as the full pipe diameter could possibly accommodate. When the air tube is removed, the concrete poured in makes a solid and permanent pile.

GAS BALLOONS ARE EXPLODED TO RELEASE PROPAGANDA

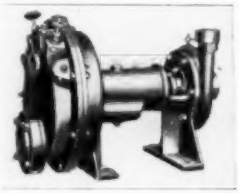
Exploding a gas balloon with a time fuse, and thereby releasing several pounds of printed propaganda on enemy territory, was an idea suggested to the war department by a Kentucky newspaper man. Various modifications of the proposed system were used with excellent effect by the allied armies in Europe. The device submitted, of which a model is shown herewith, was a hydrogen balloon about three feet high, carrying 20 lb. of pamphlets or circulars. A fuse of calculated length scatters the load by igniting the bag at any desired point.

EXPERIMENTERS FEED BARLEY TO MILCH COWS

Stockmen in the western states realize the nutritious value of barley as a standard feed for horses, cattle, hogs, and sheep; but among dairy farmers there has long been a tradition that this cereal tends to dry up milch cows. To determine the truth, several of a university herd have been subjected to a five-years' test, as a result of which it is now announced that a long period of exclusive barley feeding actually increased the milk production, lengthened lactation periods, and kept the cows generally healthy. During the war, the price of barley has been forced to a prohibitive height, but now its use as a feed for dairy cows is urged.

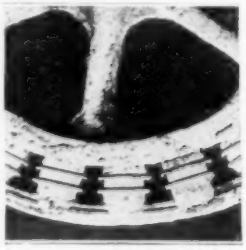
SMALL TURBINE-DRIVEN PUMP FOR BOILER-FEED WORK

Centrifugal pumps for boiler-feed work, steam-turbine driven by direct connnection, are now to be had in small sizes. The pump, turbine, and supports are combined in a single unit. The solid shaft is hung in two ball bearings, and only one stuffing box is used. The packing between bearings and steam end is a floating carbon ring, the bearings being kept uniformly lubricated by a constant-level oiling device. An excess-pressure governor and a minimum-pressure safety stop make the operation practically automatic.



SURRENDERED GERMAN TRUCKS SHOW RUBBER SCARCITY

Another "Made-in-Germany" substitute is this steel tire on a surrendered German motor truck. It will be noticed that the inventor could not entirely eliminate rubber, as pads of that material are placed between tire and rim. Rubber scarcity drove Germany to many similar makeshifts.



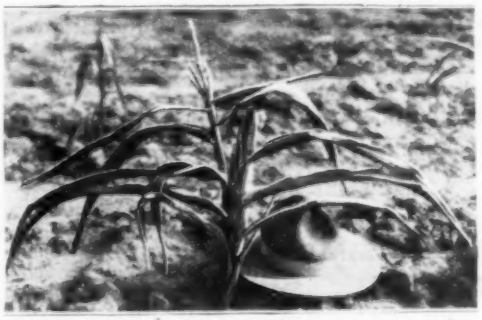
COPYRIGHT SIGNAL CORPS, U. S. A.

The Picture of a Hopi Maize Field at the Left Gives a Good Idea of the Short, Spreading Nature of the Plant and the Wide Separation of the Hills. At the Right Is a Plant of Deep-Growing Indian Corn

FROST-PROOF CORN GROWN BY INDIANS

By ROBERT H. MOULTON

MAIZE, or Indian corn, in its present form, represents one of the great achievements of primitive planters, the North American Indian. It came originally, it is now generally accepted, from southern Mexico and was eaten by the Maya tribes. At first, it was nothing but a coarse grass on which were tiny ears resembling the top of the wheat stalk. Each grain had its own envelope of husk. Occasionally even now, grains of corn are found which have their individual husk, thus showing how the maize of our day reverts to type. The plant is essentially tropical and, despite centuries of culture in the temperate zone, is still sensitive to frost.



When Maize is Grown in an Unfavorable Location, the Plant Never Grows Very High. The Size of This Specimen of Navajo Maize may be Judged by Comparison with the Hat. The Ear, in Spite of Its Close Proximity to the Ground, Is of Fair Size. This Is the Frost-Proof Variety

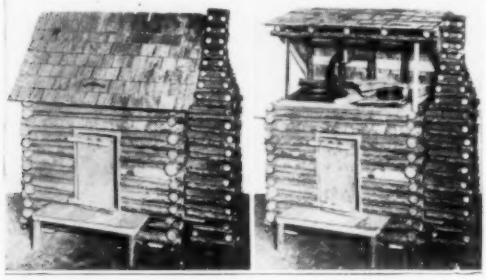
The tribes of North America saw the possibilities of the grain and hastened its evolution. There has been crossbreeding by white farmers, yet, as a matter of fact, the corn culture of the present day is practically as it came from the hand of the Indian. He has adapted and modified it to various sections of the country by a process of careful selection.

It had been accepted for many years that, in the Dakotas and much of the Northwest, it was impossible for the white farmers to grow corn because all the varieties tried were killed by frost. Recently it occurred to some scientists that despite the drawback of the weather the Mandan Indians of the North were raising corn. An expedition made a study of the agricultural methods of the Mandans, and it developed that for centuries the farmers of the tribes had been developing a hardy corn. The seed had been selected from year to year from stalks which showed no effect of frost. The stalks of this variety are so stunted that they are more like shrubs than the plant which is common to more southerly latitudes unaffected by frosts.

The secrets of the cultivation of this strangely acclimated tropical plant were found by an archæologist and not an agriculturist, and were handed over by Buffalo Bird Woman and others of her tribe in the belief that they might help the white neighbors during the recent scarcity of grain, due to the war.

LITTLE LOG CABIN SHELTERS PHONOGRAPH AND RECORDS

With the "roof" in place and the cabin door ajar, it is said that the small log cabin, built by a southern dentist, plays



"My Old Kentucky Home" Sounds Just Right When Played by This Machine

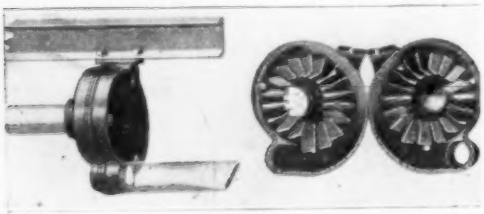
the old plantation songs particularly well. Working in his leisure hours, he built the unique case of small limbs, fitting them carefully, and filling cracks with corrugated cardboard to imitate sun-baked clay.

WHISTLES OF DIFFERENT TONE ON REFEREE'S HAND

By fastening two whistles of different tone to a leather strap, a combination is obtained that may be of advantage to referees in football or basketball games. Strapped to the hand, both whistles are ready for instant use.

MUFFLER OF HELICAL SHAPE REDUCES BACK PRESSURE

A spirally expanding path for the spent gases is the means used for reducing back pressure in a late form of automobile

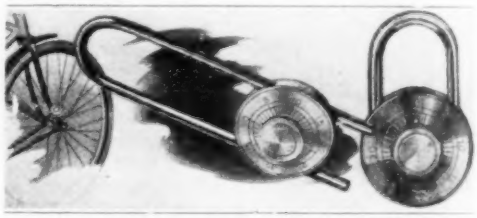


Exhaust Gases Enter This Muffler at the Center and Leave at the Periphery. They are Guided into the Outer Spiral Passage by the Radial Baffle Plates

muffler. The iron case is of flat, helical shape, the engine exhaust entering at the center and discharging at the maximum radius of the periphery. Radically arranged baffle plates guide the gases from the center to the outer annular passage, whose bore increases continuously toward the discharge opening. The small-car size weighs six pounds and is practically indestructible.

COMBINATION PADLOCK MAKES LOST KEYS IMPOSSIBLE

Used by thousands of "Jack Tars" to safeguard the contents of their "sea bags" during the war, a small, compact combination padlock is now offered to the general market. Simple modifications of the "sea-bag" form fit it for use as a common padlock, motorcycle lock, or means of securing valise or trunk. If the owner loses



Thousands of These Combination Padlocks Guarded the Sea Bags of American Tars during the War. They Are Now Available for General Use

the combination he may get it from the makers by mentioning the registered number stamped on the bow.

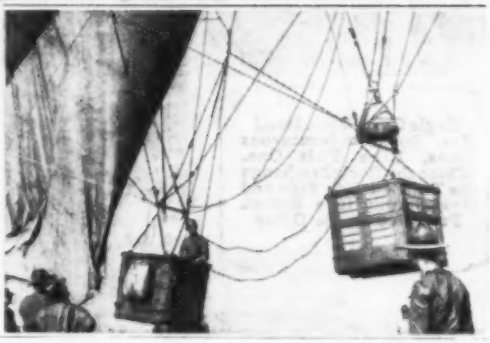
CUSHION SPRINGS LESSEN SHOCKS FROM CRUTCHES

An invention that may prove useful to many wounded soldiers is this shock absorber for the crutch, wooden leg, or walking stick. In construction it is simple, consisting of an ordinary rubber tip that is attached to a short length of seamless tubing. This tube telescopes in a larger one against the resistance of a coil spring. Being free to rotate, it is maintained that the tips do not have to be frequently replaced, as with the ordinary crutch.

¶ Miles of red tape recently went by the board when the Navy Department quietly settled obligations to the Railroad Administration with a $10,000,000 check.

NEW BALLOON PARACHUTE SAVES BASKET

When the lonesome balloon observer just back of, and above, the battle line heard overhead the staccato rattle of a German machine gun, he knew he had about five seconds for a prayer that his parachute would open, and the step which would take him from his wobbly little car into a mile of very empty space. Although the parachute would usually do its part in carrying him safely to the earth, a persistent German airman would often take pot shots at him as he helplessly drifted down. But never again! One sharp pull on a rope now releases the entire basket, which floats away, buoyed up by a parachute hung above. Thus valuable records and instruments are saved in addition to the observer. And better still from the observer's viewpoint, the basket carries a machine gun.



The Balloon Basket Itself is Shown Here, Drifting to Earth beneath the Army's Newest Parachute. Contrast This with the Old System in Which the Basket, with All Its Valuable Instruments and Records, were Destroyed with the Bag. The Small Picture at the Right Shows the Parachute Folded Compactly above the Basket. One Pull of a Rope Releases the Basket and Parachute

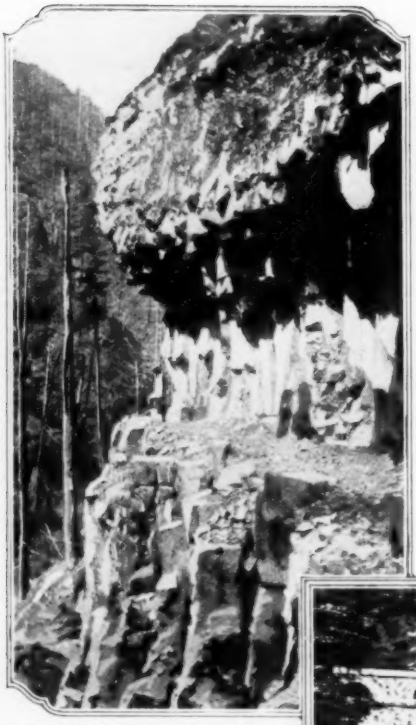
PUBLIC RECREATION GROUNDS IN NATIONAL FOREST

IN keeping with the idea that the national forests are the big playgrounds of the American people, the Forest Service has developed a public picnic and camping ground at Eagle Creek in the Oregon National Forest. These picnic grounds are located 45 miles east of Portland, on the Columbia River Highway, and were visited by nearly 100,000 persons in 1918.

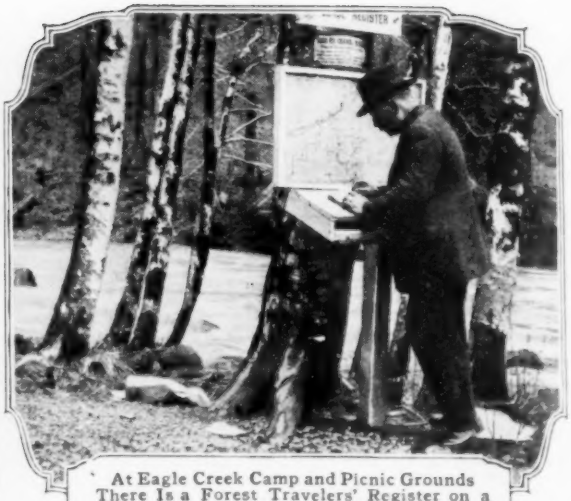
A loop road, surfaced with crushed rock, leads through the grounds so that auto parties may drive directly to a picnic site. Tables, benches, concrete stoves, stone fireplaces, garbage cans, and fuel are provided free by the government. Spring water is piped to all parts of the grounds, and a complete sewer system helps keep the place sanitary.

Scores of camp sites have been cleared up for the use of the public on both sides of the creek, and there is a large parking place which accommodates several hundred machines. Six hundred automobiles have been counted on the grounds at one time. During the last summer, crowds ranging from 2,000 to 3,500 persons visited the place for week-end outings.

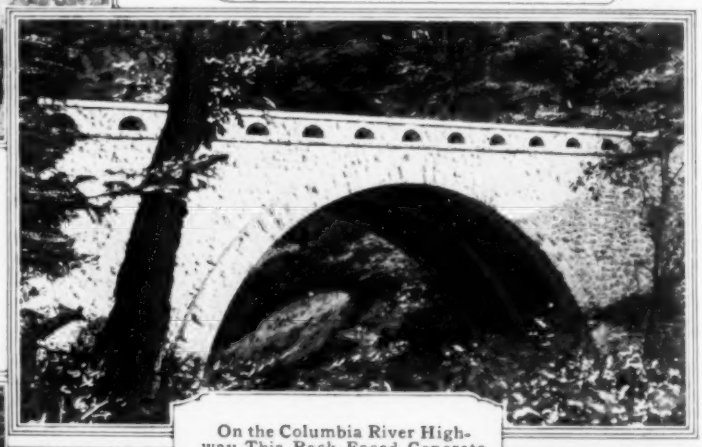
The forest travelers' register, kept on the grounds, last season bore the names of people from 42 states of the Union and a dozen foreign countries.



Eagle Creek Trail Itself Has Some Adventurous Spots, Like This One, Where the Rock Overhangs the Trail on One Side and Drops Away in a Broken Precipice on the Other



At Eagle Creek Camp and Picnic Grounds There Is a Forest Travelers' Register on a Crude Desk against a Tree Trunk. Visitors are Expected to Sign It, and to Read the Bulletins and Make Use of the Chart



On the Columbia River Highway This Rock-Faced Concrete Bridge, of Simple but Pleasing Outline, Crosses Eagle Creek, near Portland, Oregon

Here Is the Parking Place Provided for the Many Who Visit Eagle Creek Camp and Picnic Grounds, in the Oregon National Forest, by Automobile. In This Broad, Smooth Clearing There Is Plenty of Room for Cars

Wahtun Lake, at the End of Eagle Creek Trail in the Oregon National Forest, Has a Magic Quality That Makes These Portland Boy Scouts, Swimming in Its Quiet Waters, Look Like Nereids

At Eagle Creek Camp and Picnic Grounds Are Several Dozen of These Concrete Camp Stoves, Lined with Fire Brick, for the Convenience of Visitors

Eagle Creek Trail was Cut from the Face of the Rock at This Point, and Is Really Little More Than a Notch in the Precipice, with a Handrail to Make the Traveler Feel Easier

Tables and Benches, Such as This Picnic Party is Using, are Supplied by the Forest Service, and are to be Found Located in Suitable Places about the Eagle Creek Camping Grounds. Sojourners in Oregon National Forest Are Always Free to Make Use of Them

The grounds are in charge of a forest ranger who protects them from fire and assists parties in finding satisfactory camping places.

From the picnic grounds, a scenic trail has been constructed up Eagle Creek Cañon for 15 miles at a cost of $1,000 a mile. Long stretches of this trail are carved out of the solid rock, and in several places the builders were compelled to work suspended on life lines.

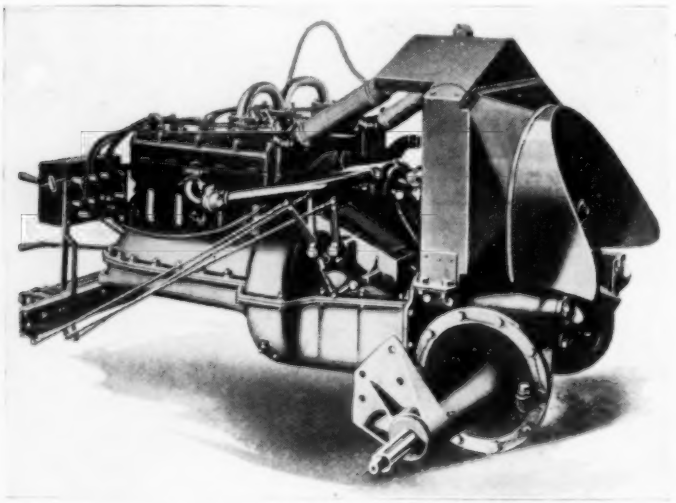
Two bridges, one a hundred feet above the water at the head of a box cañon, and the other a long bridge near the stream, carry the trail across the creek. A third crossing is made by passing the trail through a 30-ft. tunnel behind a waterfall, 150 ft. high. Late last autumn the trail was completed to Wahtun Lake, where the Portland Boy Scouts of America have established a summer camp.

Waterfalls, cañons, cliffs, and big timber abound along the trail, while native wild flowers and rare ferns lure the traveler.

It is safe to say that miles of motion and still-picture film have been exposed along Eagle Creek Trail by tourists in their efforts to carry some of its wonders away with them.

BABY TANK WITH TWO ENGINES STEERS BY SHIFTING GEARS

While interesting enough in itself, the little three-ton tank, known in the army as the "baby whippet," is chiefly remarkable for its power arrangement. The endless tread at each side has its own separate power plant, consisting of a four-cylinder engine complete with planetary transmission, such as is used in a common type of light automobile. To synchronize the engines, however, and preserve a straight course, the engine flywheels are toothed and engage an idle gear wheel mounted between them. Each planetary transmission gives its side two speeds forward, one reverse, neutral, and brake. This takes care of the steering. By running one side forward and the other reverse, the tank will turn around where it stands. Reduction from the power plants to the truck-driving sprockets is by worm gear.



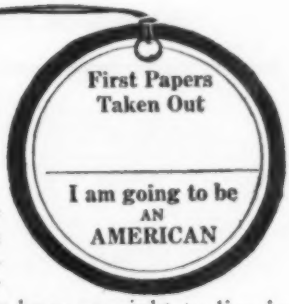
This Power Plant for Baby Tanks Consists of Two Complete Engines with Planetary Transmissions, Connected by an Idle Gear. The Transmissions Handle the Steering

FIRST STAGE IN RESTORATION OF ST. PAUL'S FINISHED

The restoration of the great central dome of St. Paul's Cathedral in London has progressed unremittingly for five years, proving quite as difficult as work on the transept mentioned in Popular Mechanics Magazine for December, 1917; but it is now reported that one primary stage, the strengthening of the southwest pier, has been completed. The most careful precautions have been necessary, as the triple dome is calculated to exert a pressure of 8,000 tons on each of the 200-year-old piers, making any serious withdrawal of support quite dangerous. Among several interesting discoveries made during the progress of the work, it was found that many of the capitals that crowned the columns were only poor copies, so insecurely cramped and doweled to the stonework that a light touch sent them to the ground. It was learned too, that, despite the boast of Sir Christopher Wren that he "built for eternity," the pier fillings were so unsatisfactory that much solidifying with liquid grout was necessary.

PROGRESSIVE CITY WILL BE ALL AMERICAN

By PAUL JENKINS



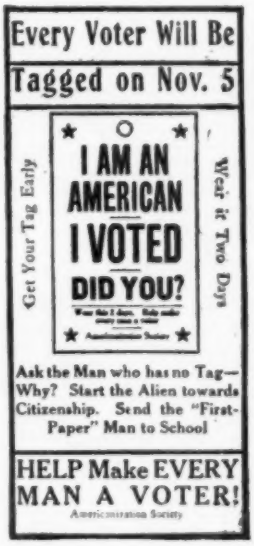
THE present world-wide dissatisfaction with the old order, and yearning for a new, has been capitalized and organized with occasional alarming success by the forces of disintegration. But in America the friends of law and order have at length recognized a potential good in this unrest; have realized that many Americans are simply ignorant that our constitution puts deliverance in our own hands. Widespread campaigns of education in the first principles of representative government testify to a recognition of this dangerous ignorance and apathy.

In one American city this constructive work is in the hands of an enterprising body well named the "Americanization Society." Realizing that individual interest is the very keystone of the American political arch, the society makes "Every Voter at Every Election" its task, with "Citizenship for Every Alien" as a corollary.

Ambitious for the largest proportion of voters in the United States, this local society uses the most modern forms of publicity and advertising in its work. Posters throughout the city tell the people to "Vote — Help Make Your Shops, Offices, and City 100% American," "Start the Alien toward Citizenship; Send the 'First Paper Man' to School," or "Prove Your Willingness to Assume the Duty of Voting." Handbills emphasize the rock-bottom principles of American government, declaring that: "The first absolutely essential step in Americanization is to convince all men that, so long as they live in a democracy and benefit by it, they are morally obliged to take part in it by voting; and if they do not vote, they have no right to live in it." And at the last election every voter was decorated with a tag announcing: "I Am an American. I Voted. Did You?"; while posters about the city advised the patriot to "Ask the Man who has no Tag—Why?"

A previous campaign was directed solely at the feminine nonvoter. Educational pamphlets were handed to her; if she registered she was given an emblem to hang in the window.

Wholesome propaganda of this type is certain to be fruitful. Already, in this city, it is reported that aliens are crowding the offices of the courts for their papers; habitual nonvoters are being brought to light, and to the polls, while every election day is yielding a large vote, in good proportion to the population.

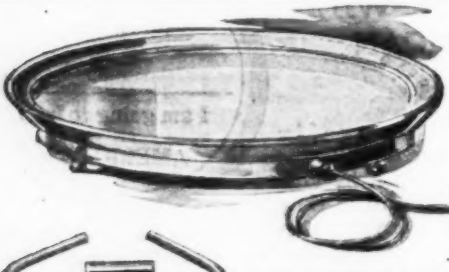


Tags and Newspaper Stories, Posters and Honor Emblems Like These, Make Duty Clear to Citizens and Aliens of One Loyal American Municipality

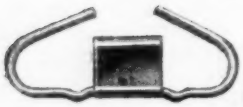
BRICK MACHINE SHAPES TAMPING CLAY

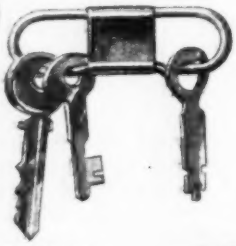
Blasting operations in large mines, where several thousand shots a day are fired, consume quantities of tamping material. At an English mine a brick-making machine has been put to good use for making plugs of plastic clay, which is the best of tamping substances. After a pug mill has mixed the clay, it is pressed through a multiple die having from six to ten 1-in. holes. Cut into pieces, 10 in. long, the plugs are then separately wrapped, and one accompanies each parcel of explosive given to the miners.

SOME NOVEL AND LITTLE-KNOWN ACCESSORIES



A Small Electrically Heated Tray That can be Connected to Any Fixture Is a Convenience in the Sick Room or for General Use in Keeping Dinner Dishes Warm Until Served





A Simple Key Ring Designed for Advertising Use can Hold Two Sets of Keys, One for the Home and One for the Office on Either Side of the Locking Number. Being Flat and Light, It may Easily be Mailed in an Envelope with Other Advertising Matter

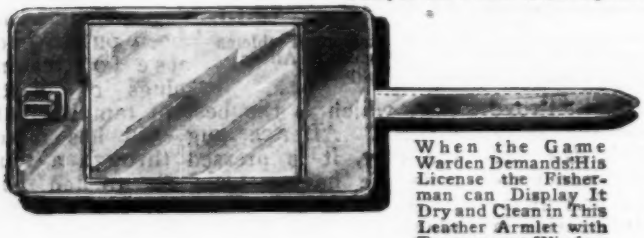
A Perforated Plate of Flexible Material, Adapted for Fly Swatting by Notching the Edges to Receive Rubber Bands, Which Act as Cushions

With the Approach of Canning Season the Housewife should be Interested in This Kettle Which Contains an Inner Tray Holding Six or Eight Quart Jars

A Sturdy Little Thermometer on the Oven Eliminates Guesswork in the Kitchen and Makes Cooking Easier

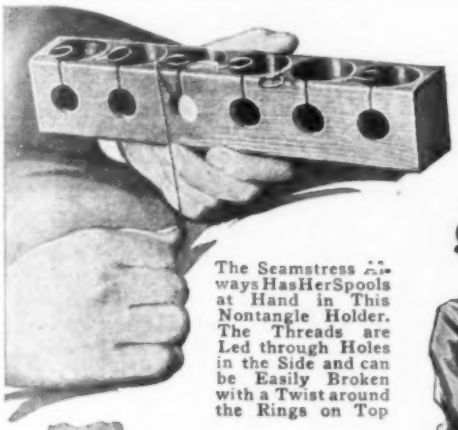
The Damper on This Alcohol Chafing Dish Makes It Easy to Regulate the Intensity of the Heat. By Closing the Damper the Flame is Extinguished

An Ornamental Hook on the Face of This Molding Hook Conceals Two Grooved Pulleys Which Make It Easy to Straighten a Large Picture. The Small Heel at the Bottom Assures Good Bearing Surface against the Wall



When the Game Warden Demands His License the Fisherman can Display It Dry and Clean in This Leather Armlet with Transparent Window

INTENDED FOR THE HOME AND ITS MEMBERS



The Seamstress Always Has Her Spools at Hand in This Nontangle Holder. The Threads are Led through Holes in the Side and can be Easily Broken with a Twist around the Rings on Top

Potted Flowers Water Themselves When Placed on This Reservoir. The Plant Absorbs What It Needs through the Sponge and Burlap

For the Front Vestibule, the Bathroom, or the Cellar Steps, a Small, Inexpensive Gas Mantle Burns Much Less Gas Than the Old Flat-Flame Burner

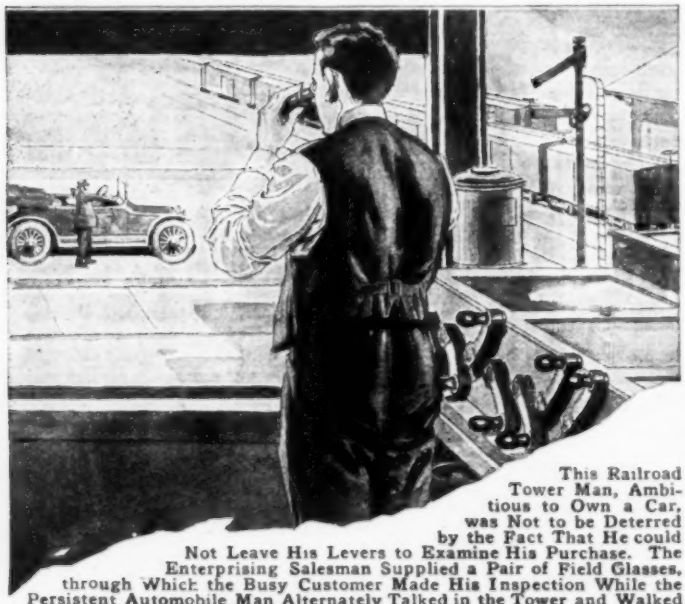
A Gas Heater on This Electric Washing Machine Keeps the Water in the Tub Constantly at the Boiling Point. The Motor-Driven Wringer Does Away with Fatigue, and may be Conveniently Swung to Any Desired Position of the Tubs

This Combined Fancy-Work and Vanity Case Holds Mirror and Purse, and a Ball of Yarn or Thread, Which may be Used through a Hole in the Cover

A Rubber Bathing Cap That Resembles an Airman's Helmet Keeps Water Out of the Ears by Means of Two Reinforced Protectors

FIELD-GLASS VIEW SELLS CAR TO BUSY CUSTOMER

A resourceful automobile salesman recently overcame a seemingly insurmountable obstacle when he encountered a customer too far away from the car to examine it, and too busy to come closer. The buyer was a railroad tower man, who could not leave his levers and signals even for five minutes. The road where the car stood was several hundred feet away. The salesman managed to get a pair of field glasses, and through these the "prospect" inspected the car while the automobile man talked. The sale was made.



This Railroad Tower Man, Ambitious to Own a Car, was Not to be Deterred by the Fact That He could Not Leave His Levers to Examine His Purchase. The Enterprising Salesman Supplied a Pair of Field Glasses, through Which the Busy Customer Made His Inspection While the Persistent Automobile Man Alternately Talked in the Tower and Walked Out to the Road to Point His Moral

CONTROLLER CONTACTS SAVED BY INTERRUPTING CURRENT

Saving controller contacts from damage by arcking is the object of a European inventor. In series with the contacts he connects hot-cathode rectifier tubes, whose heating circuit is broken by the switch arm in advance of the main circuit. The momentary interruption of the current prevents any arc formation.

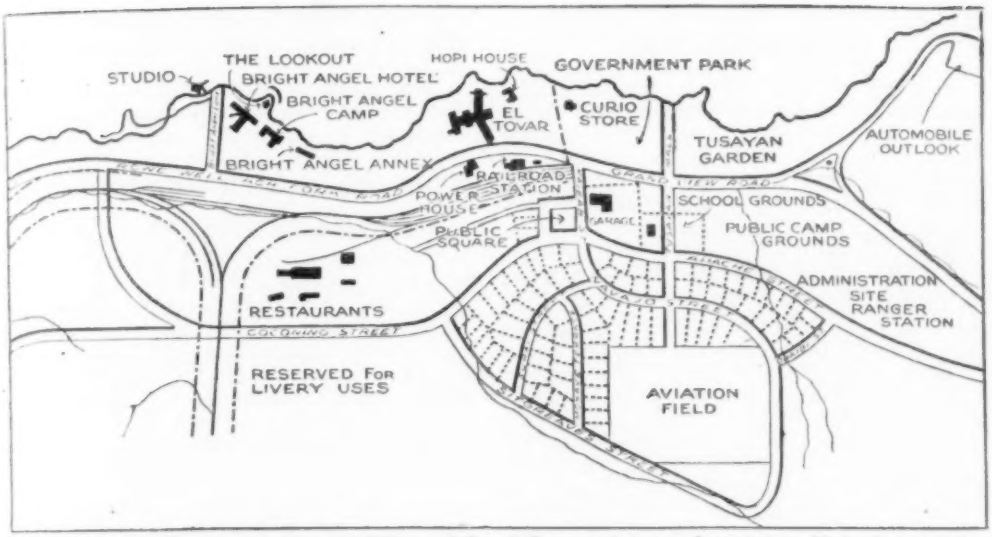
¶An American still holds the world's airplane altitude record with 28,900 ft., as recent rereading of the British claimant's instruments showed a revised height of only 27,000 feet.

COAST-DEFENSE MORTARS IN PRIVATE GARDENS

To the constantly growing story of America's war activities must now be added the report of a government camouflaeur who describes his work done on the Atlantic seacoast. Due to government suspicion that U-boats were using a base near Cuba, he says, he was commissioned to camouflage the dirigible hangars and large hydrogen plant near Pensacola, Fla., which he did with such success that the structures were indistinguishable from five miles at sea. Of most interest, however, is his description of the concealment of the heavy coast-defense mortars, some of 12-in. bore, which guarded New York Harbor. The massive concrete emplacements were often placed in private gardens, as much as two and a half miles from the coast, where they were hidden from aerial observation by trailers of "artificial honeysuckle, morning-glory, and ivy," which were changed in color according to the seasons.

NO SLIPPERY CAR STEPS WITH NEW TREAD

The ordinary steel treads used on public stairways, car steps, etc., are an undoubted economy, but they are equally a nuisance to the pedestrian, particularly during wet weather. But this is not the case, it is maintained, with a one-piece, nonslipping tread that is now being marketed. This tread consists of a light iron baseplate which is channeled or punched to receive lead inserts rolled into the plate and securely interlocked. A wearing sur-



Plan of Proposed Improvements to the Village of Grand Canyon, Arizona, Intended to Make It a Fitting Gateway to the Great Scenic Wonder: New Features Are the Public Square, Bright Angel Lane, Government Park, Tusayan Mall and Garden, Automobile Outlook, Public Camp Grounds, and the Future Aviation Field

face is thus presented that is nonslipping in all directions, yet slow in deteriorating, as the iron skeleton lies flush with the lead and hence prevents rapid wear.

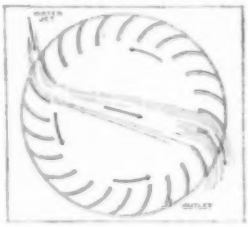
PLANS FOR IDEAL GATEWAY AT RIM OF GRAND CANON

The main point of entry to the Grand Cañon of the Colorado River is a little Arizona village of not more than 400 permanent residents. It is among the plans of the United States Forest Service to make of this community of Grand Canyon, a model town devoted to one purpose: providing for the visiting public in a manner appropriate to the gateway of so vast and awe-inspiring a landscape. The settlement, now almost formless, would be laid out about a central plaza, preserving the standing groves of yellow pine.

On the brink of the cañon the plan locates Government Park, as the official approach to the rim, leaving for future development a more formal means of introduction to the impressive view. Eastward along the margin lies Tusayan Garden, interesting in prospect for its collection of local flora. Still farther east, where the cañon wall drops sheer 1,000 ft., the automobile visitor is provided with an outlook and parking space. A footpath to Yavapai Point touches the actual rim only occasionally, giving the pedestrian opportunity for emotional recovery between drafts of scenic stimulant. At the point is planned a shelter, invitingly visible from the village. The entrance to Bright Angel Trail is to be dignified by the opening of a 50-ft. strip to be known as Bright Angel Lane. The plan even reserves space for an ultimate airplane-landing field. The village itself, now extraordinarily hampered by lack of organization, its land all government-owned, without water supply or sewerage system, is to have such improvements as the peculiar circumstances allow, and its natural beauties are to be emphasized.

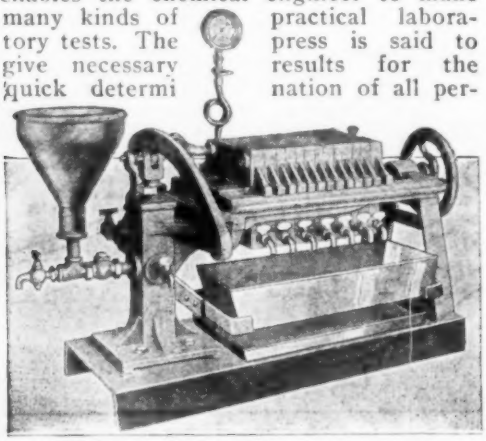
DOUBLE-ACTION WATER WHEEL IS LIGHT AND EFFICIENT

In a water turbine, designed by a Hungarian engineer, the jet passes diametrically through the wheel after working on one side and spends its last energy against the vanes of the other side. The vanes are curved, and the water strikes them at a tangent, just above the horizontal diameter. After shooting across to the opposite side, it is discharged near the bottom of the wheel. The width of the turbine varies according to the power desired. The peripheral speed is between 98 and 164 ft. per second. Laboratory tests of a small model showed efficiency as high as 89 per cent.



FILTER PRESS FOR QUICK PRACTICAL TESTS

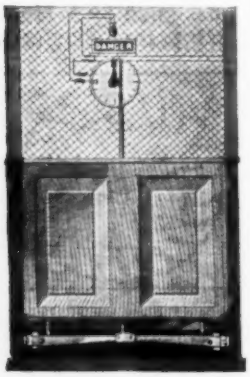
A compact filter press of a new type enables the chemical engineer to make many kinds of practical laboratory tests. The press is said to give necessary results for the quick determination of all percentages desired in the use of certain materials. Designed with flush-type corrugated surface plates and extension frames, it allows either, or both, cloth or filter paper to be used. The press will stand a working pressure of 150 lb. per square inch. The machine weighs about 180 lb. in either iron or brass.



A Filter Press of Possible Value to Many Manufacturing Plants

LIGHT WARNS WHEN ELEVATOR IS OVERCROWDED

A recent attachment for passenger or freight elevators flashes a red light, or rings an alarm bell, when the car is overcrowded, thus enabling passengers to check overloading in the interest of their own safety. The invention consists primarily of a common platform scale, which supports the passengers, and depresses a vertical rack rod when loaded. This rack is engaged with a pinion, and thus revolves a pointer on a conspicuous, calibrated dial. When the pointer is turned to a predetermined danger point, an electric current is closed which operates the alarm feature.

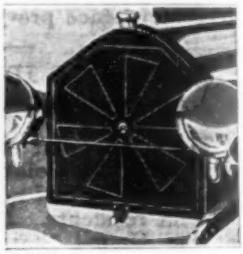


PERSISTENT EFFORT REVIVES GIRL TEN HOURS IN WATER

The wisdom of continuing resuscitation processes, even after it is apparently hopeless, is strikingly demonstrated by the extraordinary experience of a Guerneville, Calif., school-teacher. She fell into the sea while taking surf pictures, and was washed ashore about 10 hours later. Life apparently was extinct. Nevertheless, her rescuers worked over her for five hours with hot applications, vigorous rubbing, and hot stimulants. She regained consciousness after a total period of insensibility of 15½ hours, and in a short time fully recovered. The fact that she was stunned by her fall evidently saved her from drowning during the long immersion.

ADJUSTABLE RADIATOR COVER KEEPS AUTO ENGINE WARM

Automobile drivers who stick sheets of paper on the front of the radiator to keep the engine from catching cold will welcome an adjustable radiator cover which is as neat in appearance as it is effective in action. It is made of heavy blanket cloth and sheet steel, having six radial openings which are closed, or varied in size, by turning a six-bladed shutter pivoted at the middle. The cover fits perfectly, being made for any type of car.



FRESH SOURCE OF FUEL AVAILABLE

Many attempts to compress into "briquettes," and hence make commercially available, the large accumulations of small coke and coke dust about every gas plant have all failed till recently, because coke lacks completely the bituminous, "tarry" qualities that fit coal dust for this process. Earlier experimenters found it impossible to find a cheap, practicable substitute "binder," and discovered, furthermore, that the open pores of coke absorb water, causing explosion in the furnace and consequent shattering of the briquette. So the problem has been to find

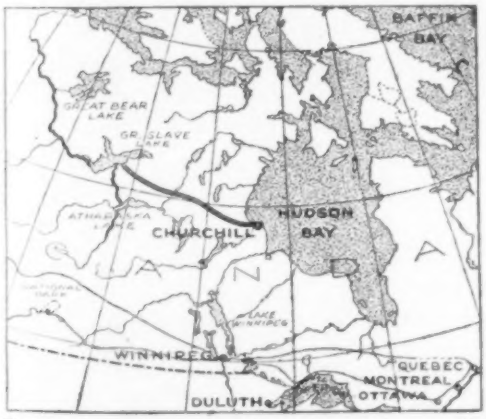
a cheap bituminous material that will mix with, and bind, small coke, in addition to filling its pores. And such a material is now reported in actual use at Wittenberg, Germany, being a tarry by-product from the manufacture of oil gas.

ENGLAND'S RICH DISCARD LONDON TOWN HOUSES

For hundreds of years members of England's wealthy class have maintained their splendid town houses in London. But today, with the perfecting of the automobile and the increased convenience of apartment and hotel, there is a growing tendency to break with tradition and maintain only the country home. This fashionable back-to-the-land movement is expected to have royal sanction, too, as the king and queen will use beautiful old Windsor Castle, 25 miles from London, this season, much more than Buckingham Palace, in the city.

PROJECTED RAILWAY WILL TAP NORTHERN CANADA

Northwestern Canada's fur trade, and the prospect of opening up her stores of mineral wealth, have induced a group of capitalists to petition the Canadian government for permission to build a railway that will run east and west from Hudson Bay to Great Slave Lake, about 700 miles



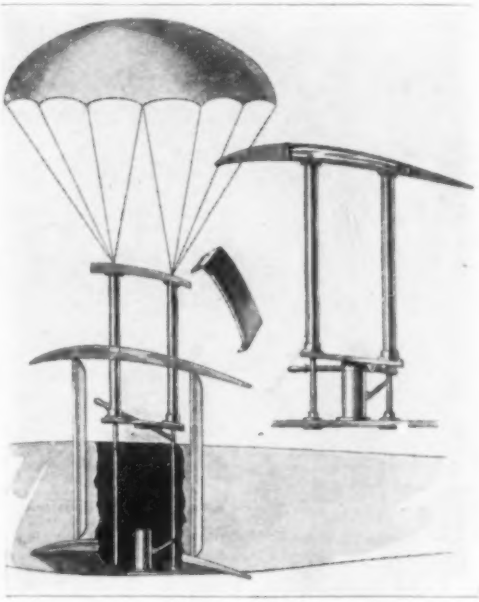
The Unmeasured Riches of Canada's Northwest will be Released by the Far Northern Railway Indicated by the Heavy Parallel Lines

north of the American border, and, it is stated, some 400 miles north of any existing line.

Schenectady, N. Y., is honoring its returned war heroes with municipal medals.

EXPLOSION TO EXPEL AIRMAN AND PARACHUTE

His airplane falling out of control, a pilot equipped with this unusual safety arrangement would drop his right hand



Showing How an Inventor would Fold a Parachute within a Tray in Airplane's Upper Wing: An Explosive Charge in the Cylinder Would Expel the Airman and Parachute

to a lever beneath his seat. A jerk upward, an explosion—and pilot, his seat, three auxiliary struts, and part of the upper wing would be drifting to earth beneath a parachute. The inventor provides that the parachute be folded inside a tray which forms part of the upper wing, while the expulsive cylinder is placed under the pilot's seat.

FIRST THROUGH TRAIN FOR WOUNDED YANKS

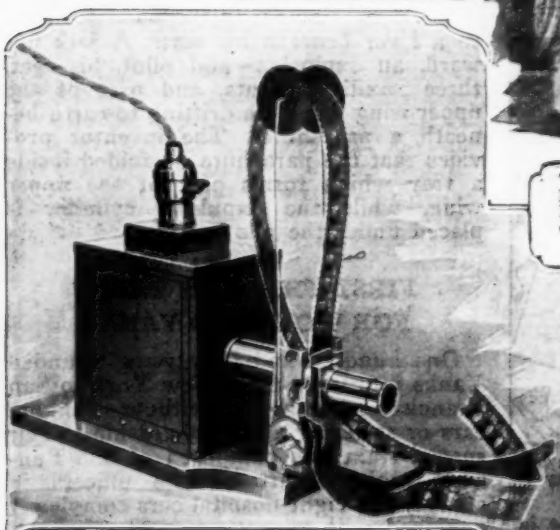
One hundred and twenty-six wounded Yanks journeyed from New York to San Francisco not long ago without changing cars or suffering a single hardship. Their special train was composed of one Pullman, which quartered the officers in charge, and eight hospital cars completely equipped with operating room, kitchens, and wide comfortable cots. Although many of the boys were walking cases, all had their meals served on small tables at their bedsides. Four officers and 25 men accompanied the wounded as attendants.

INTERESTING IDEAS, PICTURES, AND TOYS

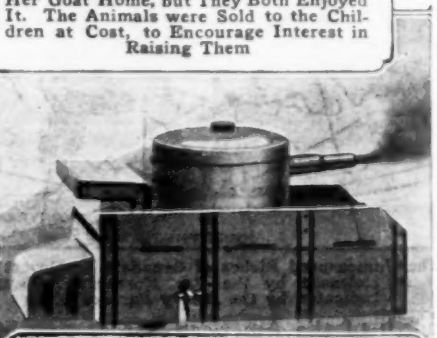
When the City of Portland, Oregon, Distributed 100 Milch Goats among Its School Children, There Was Considerable Excitement about Getting Them Home. This Mother Goat is Willing to Enter a Wagon to Join Her Kid

One Enormous Egg Hatched These Twin Ostrich Chicks. Unfortunately They did Not Live Long, and the People on the Ostrich Farm at South Pasadena, California, Where They were Born, had Them Stuffed

This Little Portland Girl had to Lead Her Goat Home, but They Both Enjoyed It. The Animals were Sold to the Children at Cost, to Encourage Interest in Raising Them



Regular Film, the Same Size as the Big Machines Use, Goes into This Toy Moving-Picture Outfit. It Is So Simple and Inexpensive That Any Boy, or Girl for That Matter, can Have a Movie Show Right in the Parlor



A Puff of Smoke Every Time the Gun Bangs Is the Big Feature of This Nine-Inch Tank, Which Winds Up with a Key, and Shoots as It Travels over the Carpet Battle Field

FOR BOYS AND GIRLS IN HOME AND SCHOOL

Cincinnati Schoolboys, Doing "Kitchen Police," Find This Duty Rather Pleasant. They are Serving to the Girls the Meal They have Prepared

Cooking for Boys Is a Regular Class in a Cincinnati Public School Now, and the Boys Take It Quite Seriously. Here We See Them Cooking the Noonday Meal for the Rest of the School, under the Guidance of a More Experienced Cook

Talent Will Out, and the Fifteen-Year-Old Boy Who Whittled This Statue of Abraham Lincoln Out of a Piece of Driftwood with a Jackknife is Having Some Pleasant Predictions Made about Him. He Lives on a Farm and has Never Studied Art

This Young Fellow has Just Discovered That the Garden Hose Makes a Fine Speaking Tube. It Is Much Better for Play Telephoning Than the Old String and Tin-Can Arrangement, and Works Nicely between Two Back Yards

It Is Hard to Find a Way to Improve "A B C" Blocks, but These Are Really Better Than the Old Kind Because Their Corners and Edges Are Round, and It doesn't Hurt So Much to Fall on Them

GRACEFUL EXAMPLE OF WORK IN ARTIFICIAL STONE

A living-room fireplace constructed of logs and twisted limbs would excite interest from its incongruity alone. But the truth is even more curious, as the work was done by a cement worker who specializes in imitation. Cement is the material used, and so naturally and gracefully, that the visitor is tempted to test it with his pocketknife. The texture and colors of nature are reproduced with startling faithfulness.

A Cement Worker Cleverly Imitated the Texture and Colors of Nature in This Mantlepiece

GOATS GRAZE FIRE BREAKS TO REDUCE FOREST FIRES

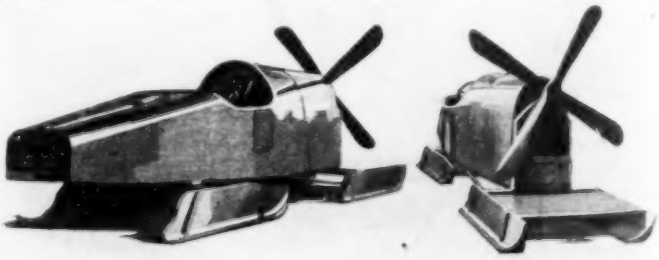
Four hundred milch goats have been procured by the forest administration of the Angeles Forest Reserve and are to be used this summer for lessening the menace of forest fires. This is to be accomplished by grazing the animals in the fire breaks, thus eliminating much of the danger of spreading fires by keeping these barriers clean.

Wires are being strung through the middle of the fire breaks, and to these the goats will be ring-tethered, so that each animal may graze only in the fire break and yet cover considerable ground.

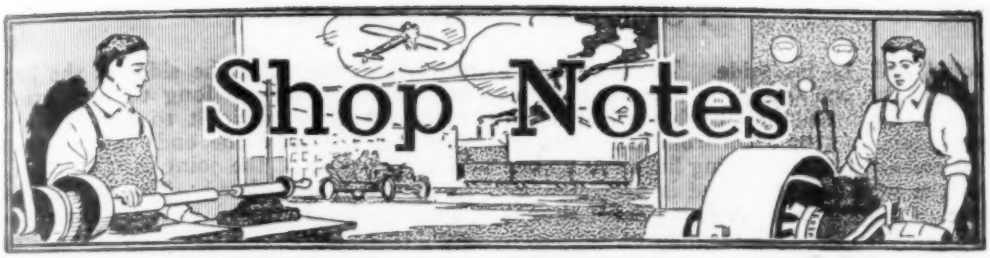
The 400 goats are to be used in that portion of the Angeles Forest Reserve between the Cajon Pass and Great Bear Lake. By reason of the benefits to the forest, the goats are accorded free grazing privileges by the government. Besides supplying milk to the families of the forest rangers, to whose lot it falls to attend the herds, it is expected that there will be a considerable quantity of milk to be sold to trout fishermen, campers, and other sojourners within the forest.

FAST POWER SLED IS BUILT FOR RURAL-MAIL CARRIER

One of the northwestern states boasts a rural postman who covers his route by motor car in summer and by motor sled in winter. Some time ago the carrier had a special snow-and-ice "boat" built to meet his particular needs. The vehicle, with a body similar to that of a light speedster, mounts a 40-hp. motor that turns a four-blade air screw of the tractor type. A speed of 30 miles an hour on soft snow, and 70 miles an hour on smooth ice, is said to be attained. In over-all length the sled measures 16 ft., while the weight amounts to about 950 lb. A storage compartment of generous size is provided in the rear portion of the body. The fuel consumption compares with that of an average motor car. The runners, intended for both snow and ice, are shaped like hollow-ground skates and bear on a surface, 6 in. in width and a little less than 5 ft. in length.



Motor Sled with Air Propeller and Unusually Broad Runners, as Seen at the Right: Left View Indicates Large Storage Space at Rear

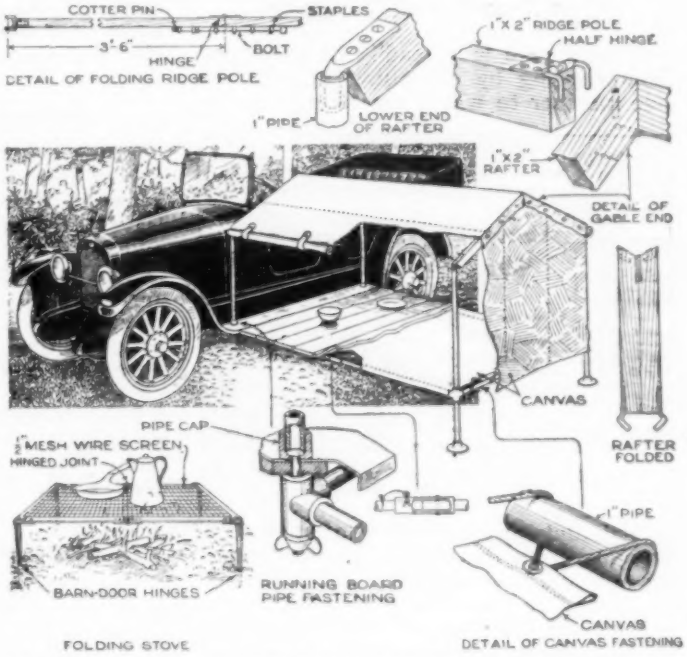


Camping by Automobile

By P. P. AVERY

TO automobile owners who wish to avoid the uncomfortable hotel with its hot, stuffy rooms, the camping outfit illustrated makes its strongest appeal. It requires only a few minutes to set up camp, and the outdoor meal and sleep may be enjoyed even better than in the usual cramped, inconvenient, permanent camp.

A full-sized, substantial bed is made by fitting lengths of 1-in. pipe together with side-outlet tees, to form a frame 5 by 6½ ft. The pipe need not be screwed tightly into the tees, and can thus be taken apart easily. The two legs at the outer end are screwed into the tees and into floor flanges, which rest on the ground. The height of the legs depends on the height of the running board, to which the other end of the bed is attached by a bolt, as shown in the detail. The awning support is also of 1-in. pipe, with side-outlet tees at the corners. It is supported by short lengths of pipe, which screw into the pipe caps on the running board of the car, and into tees at the outer edge, or foot, of the bed. Sixteen-ounce canvas is used for the mattress, in which wide hems are sewed with very strong seams. The pipes at the side are slipped into the hems. At the ends the mattress is held by stout cords, laced through eyes in the canvas, so that it can be tightened and loosened as required. The awning is 8 or 10-oz. canvas, made like a tent to fit easily over the pipe frame. The sides should be made to roll up and fasten with straps. If these rolls are too long to carry conveniently, the curtains may be cut in two and lapped over when in use.



Automobile Camping is Made Possible by the Portable Bed, Table, and Grate, Which can be Packed on the Running Board of the Car

Cooking over a camp fire is one of the pleasures of camping, and a good grate will diminish the danger of food falling into the fire. The grate shown in the sketch has a substantial 18 by 24-in. frame of 3/16 by 1¼-in. strap iron, bolted together at the corners. The legs are 12 by 4-in. strap hinges, bolted to the frame. Heavy ½-in. mesh wire screen is riveted to the strap iron for a covering. It is the work of only a few seconds to set up the grate over a fire.

At meal times, the bed is quickly converted into a table. It is only necessary to provide five ⅞-in. boards, 5 ft. 2 in.

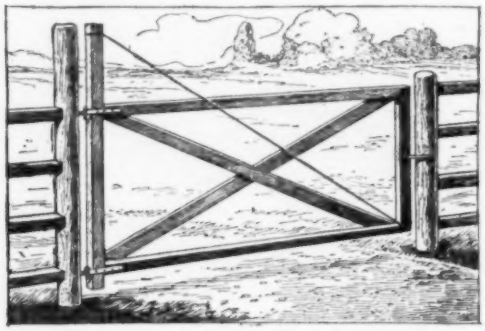
long and 12 in. wide. These are laid across the bed frame; grooves should be cut in the boards where they will rest on the pipes, to keep them from being pushed off endways. The awning flaps roll up out of the way, and the food is protected by the awning above. A camp stool should be provided for each member of the party.

Since all parts of the outfit can be taken down and the pieces stored in very little space, it is possible to fit beds to both sides of the car, and thus provide for a party of four persons. The pipes and boards pack onto the running board, where they are held by stout straps. If the 6½-ft. pipes for the sides of the bed are found to be too long to be carried easily, it is not difficult to cut them in two and telescope the ends into a piece of larger pipe at the joint in the middle, as shown in the detail. This method is much to be preferred to using an ordinary threaded coupling, which makes but a weak joint for such a purpose.

Practically no family which possesses a car need forgo all the pleasures of camping, when the outfit can be so cheaply and easily made. It will pay for itself many times in added health and the pleasure derived.

Gate Braced against Sagging

A farm gate may readily be prevented from sagging by extending upward the side member to which the hinges are attached, and running a piece of steel wire, or cable, from the top of this member to the opposite lower corner. The wire may, of course, be attached to the upper corner, but the fastening as shown places the least strain on the wire brace.—W. Wallace Snyder, Bedford, N. Y.



A Farm Gate That will Not Sag is Supported by a Diagonal Wire Brace

Making Auto Hood Waterproof Protects Coils

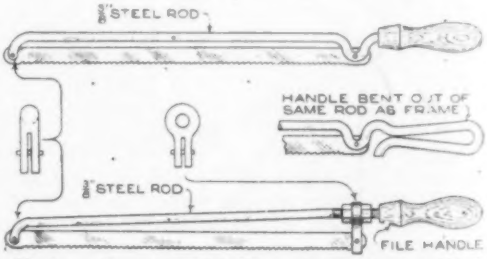
A common trouble experienced by automobile owners, when driving in the rain, is to have water leak down between the coil and dash, and thus short-circuit the terminals of the spark coils. Since the wood of the dash soaks up the water, it often takes a long time to dry the dash sufficiently to get the car started. By forcing a length of heavy, coarse cotton cord between the dash and cowl, and giving it three coats of shellac, allowing this to dry between coats, the leaking is stopped, and the car will not be stalled because of the coil terminals being short-circuited.

Drilling Holes through Cork

When a hole is made in a bottle cork, as, for example, to hold a glass tube, the material crumbles when pierced, and leaves a ragged aperture. A smoother job will be obtained by putting the cork in melted paraffin, and holding it below the surface with a hatpin until all the air pockets are closed up. Move the cork about so that all the air in it may escape. After the cork has been removed and cooled, it can be drilled, cut, or turned in a lathe as easily as soft wood, and yet is sufficiently elastic to stop bottles effectively.—Victor H. Todd, Rainbow Lake, New York.

Hacksaw Frames for Tight Places

Three styles of hacksaws, which can be used where the regular hacksaw frame could not, are shown in the sketch. In each of these the frame is made of ⅜-in. steel rod, bent to shape and slotted to hold the saw blade. Small holes drilled in the side of the slotted portion admit the pins that hold the blade in place. A



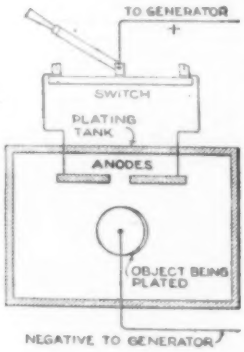
Hacksaw Frames Which Allow the Mechanic to Work in Narrow Places will be Found Useful in Any Shop

handle may be put on the end of the steel rod, or the rod itself may be bent to form the handle. Adjustment may be secured by threading the rod and providing a slotted piece to hold the blade. This is adjusted by turning two nuts on the threaded part of the rod, one on either side of the slotted piece.—C. C. Spreen, Detroit, Mich.

Double Anode for Electroplating

When the plating tank is used continuously during the day, it will be found that after a certain short length of time, depending upon the type of work to be done, the speed of plating decreases, without a corresponding increase in the quality of the deposited plate. This condition is brought about by corrosion of the surface of the anode, due to electrochemical action.

A system of double anodes may be used to speed up the plating process, and at the same time greatly improve the quality of the work. Two anodes, insulated electrically from each other, are suspended in the tank. The switch arm is connected to the positive line of the generator, while the two contacts are connected as shown in the sketch.



The object to be plated is connected, as usual, to the negative bus bar. After 15 or 20 minutes' plating with one anode, the switch is thrown, disconnecting one anode and diverting the electric current to the other. Meanwhile the acid in the plating bath will dissolve the corrosion on the idle anode, so that it is ready for use when the current is switched back to it.—Kenneth Coggeshall, Webster Groves, Missouri.

Irrigation Water Cools Roof of House

A reduction of temperature of from 15 to 20° in the interior of his home during the hottest summer weather is accomplished, by a California ranchman, by leading the water with which he irrigates an orange grove over the roof of his house before it is taken into the field laterals. The water is spread over the roof by a system of spray pipes along the ridges. It runs down the roof, cooling

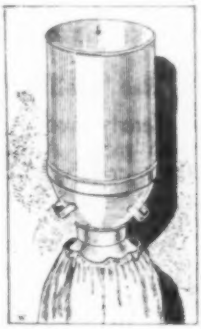
Water to be Used for Irrigation First Performs Another Duty in Cooling the Roof of the House

the house, and is then collected in the gutters to be used for irrigation.

The flow and volume of the water running over the roof is regulated by a valve in the supply pipe, which passes through the kitchen. The amount of water needed for irrigation is always far in excess of that which can be taken over the roof, hence on the hottest days the most thorough cooling is easily attainable. Obviously the fire risk on the property is greatly reduced.—John E. Hogg, Alhambra, Calif.

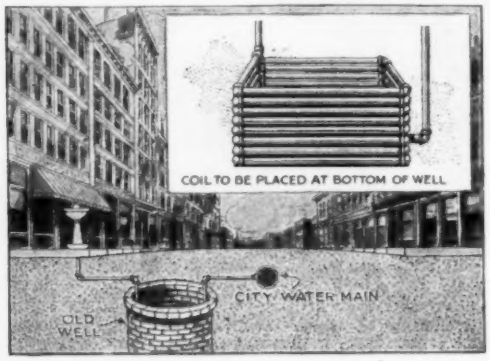
Milk Can Used for Grain-Bag Holder

An easily made grain-bag holder is shown in the sketch. Secure an old 5 or 10-gal. cream can, and remove the bottom. Then punch a ½-in. hole in the side of the can, near the bottom, and three smaller holes in the neck of the can, spaced equal distances apart around it. Into these three holes, insert belt hooks or hog rings, and clinch them, leaving the hook on the outside of the can. Hang the can on a spike or heavy hook on the wall, or on a post, and fasten the grain bag on the spout by means of the small hooks. The bag is then easily filled. If the holder is to be used with different lengths of bags, it may be hung up by a rope or chain, so as to be quickly adjustable in height.



Old Well Employed to Cool Public Drinking Fountains

In many cities which have acquired water systems, there are old wells which have been abandoned and closed. The



The Cold Water in the Old Well, No Longer Considered Fit for Drinking, was Used to Cool the Water Piped to the Drinking Fountain

illustration shows how one of these was used in a western city to cool the water used in a public drinking fountain. The supply pipe for the fountain, instead of running directly from the water main to the base of the fountain, led first to the coil pipe which was placed below the water line in the old well. As the drinking water flowed through the turns of this coil, some of its heat was radiated to the cold water in the well, and, on emerging at the upper end of the coil into the pipe leading to the fountain, it was several degrees cooler than when leaving the water main. The device is especially effective on fountains of the type which are not running continuously, but are turned on by pressing a lever.—C. E. Cory, Fort Scott, Kan.

Rat "Hallway" for Poultry Houses

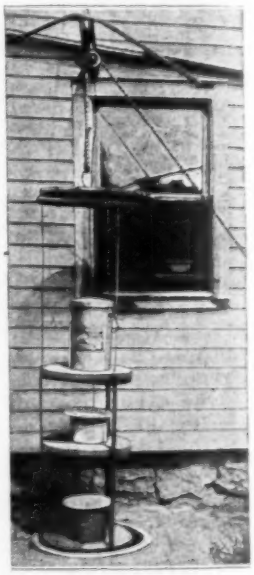
Nearly every poultry man is troubled with rats. A simple device for catching them consists of a rectangular box, 6 in. square at the two open ends, and 30 in. long, with the top either hinged or loose. This serves as an entrance from the outside wall to the henhouse floor, under which it is buried. A steel trap is placed inside it. No attempt is made to conceal the "hallway," but the trap is always kept set and all other entrances are carefully blocked. Sometimes the rats treat the device with suspicion for a while, but they are caught in far larger numbers than by patent traps set with bait.—J. T. Bartlett, Ft. Collins, Col.

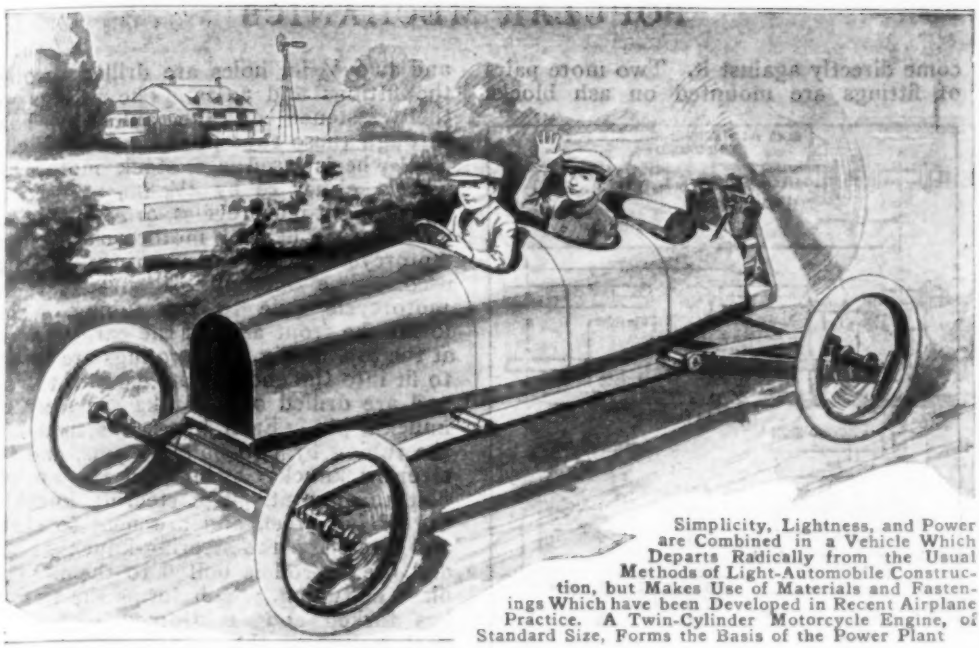
"Running-In" Automobile Engines after Overhauling

The introduction of new pistons, and other parts, into a newly overhauled automobile motor causes the mechanism to run stiff, and makes cranking difficult. The housing of an inclosed flywheel makes it impossible to use a belt with mechanical power for "running-in," and to take care of such cases, a repairman kept an old engine and automobile frame mounted on blocks. He placed the overhauled engine on the same frame, with the two engines back to back, and coupled the yoke of the forward universal joint of one of them to the corresponding yoke on the other. The old engine was then started up, and was run from low speed, through intermediate, and into high, until the engine which had been overhauled ran without undue friction.—S. Vierengel, West Palm Beach, Fla.

Food Kept Cool without Ice

The problem of how to keep food cool without ice was solved for one household in the manner illustrated. A hole was dug in the ground, about 7 ft. deep and 18 in. in diameter, and was lined with sewer tile and provided with a cement bottom. The "refrigerator" consists of several circular shelves slightly smaller than the sewer tile, attached one above the other by steel rods. These hang from a rope which runs over a pulley block, and is coiled on a windlass provided with a ratchet and pawl. Thus the shelves can be raised to any height by winding up the rope, and the food can be removed or inserted. The topmost circular piece, or cover, of the refrigerator is large enough to rest on top of the sewer tile, which should project from the ground far enough so that water will not drain into the well.—Henry J. Wagner, Ashton, Ill.





Simplicity, Lightness, and Power are Combined in a Vehicle Which Departs Radically from the Usual Methods of Light-Automobile Construction, but Makes Use of Materials and Fastenings Which have been Developed in Recent Airplane Practice. A Twin-Cylinder Motorcycle Engine, of Standard Size, Forms the Basis of the Power Plant

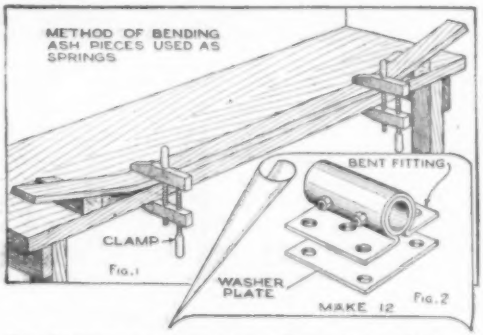
Building an Air-Propelled Speedster

By F. D. BURKE

THE application of the air propeller to road vehicles is a subject which possesses a lure all its own. The air propeller makes possible a vehicle of any power and speed up to the limits of safety on the road, without the complications of clutch, gear shift, and differential. Many persons have the impression that an air propeller cannot move a very heavy vehicle. This is erroneous; very heavy motor trucks have been moved at a good rate of speed by the thrust of air propellers. It is true that the air propeller does not provide much increase of the driving force at low speed; in fact, for this very reason, air-propelled vehicles cannot be expected to compete with gear-driven ones for hill climbing. It is on fairly good roads, in more level country, that the air propeller shows to the best advantage, giving real power at good speeds, without gears to wear out, or any complicated transmission mechanism. The speedster here described is not intended for use on city streets; first, because it cannot claim to have a good "getaway" for city-traffic running, and second, because the air propeller is dangerous where persons might be struck by it.

Chassis Springs

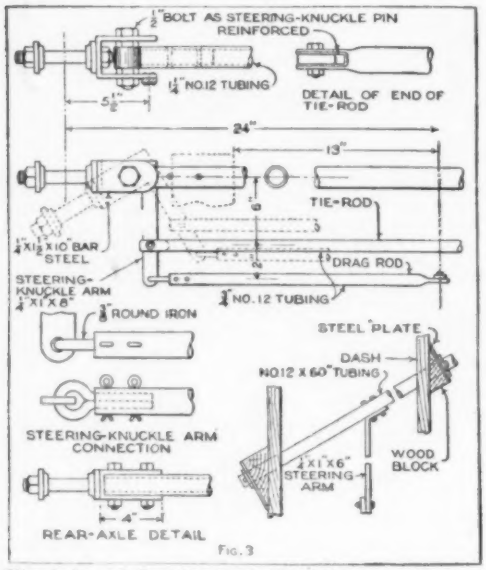
As will be seen in the illustration above, the car is built on two long straight-grain pieces of white ash, which have their ends bent down at least 6 in. by being steamed and held in a form. The method of bending is shown in Fig. 1. The wood should first be steamed or soaked in hot water, and then allowed to dry thoroughly before removing from the bending form. The axles and body are fitted to these springs by 12 bent fittings, all identical in shape and size, made of sheet steel bent around tubing to make



The Springs are Steamed and Bent, Using Ordinary Wooden Clamps. Twelve Identical Steel Fittings are Required for Fastening the Body, Springs, and Axles

a snug fit, as shown in Fig. 2. Two of them are bolted to the underside of each spring, one at each end. The washer plate is used, in each case, on the opposite side of the board, and the bolt heads

come directly against it. Two more pairs of fittings are mounted on ash blocks

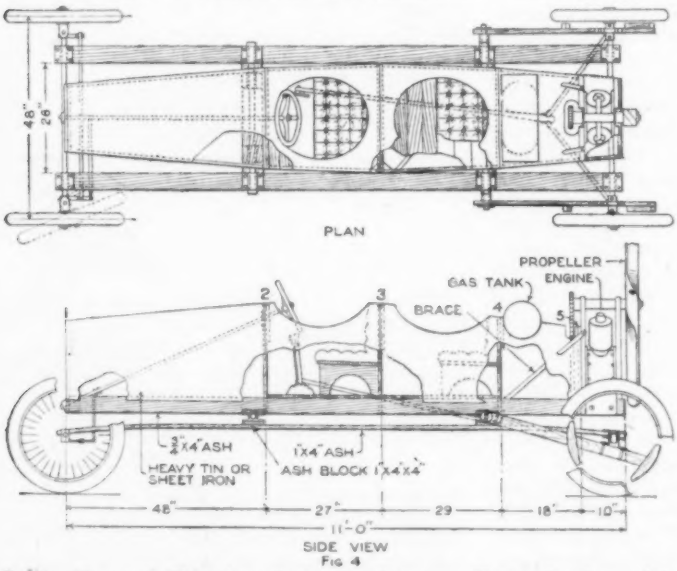


The Axle and Steering-Gear Construction is Marked by Simple and Vibration-Proof Fastenings Throughout

bolted to the springs, as shown in the assembly view, Fig. 4.

Axles and Wheels

The front and rear axles are made of the same size of steel tubing, specified in Fig. 3. The ash springs are spaced the proper distance apart, as given in Fig. 4, and two ¼-in. holes are drilled through the fittings and axles. The fittings are then fastened on the axles by bolts through these tubes, as shown in Fig. 2. The wheels used are stock motorcycle wheels, either 26 by 2½ in., as used on light-weight motorcycles, or 28 by 3 in., as used on the heavier motorcycles. Stock motorcycle axles and bearings are also used. The method of attaching the motorcycle axle to the tubing, which forms the front axle of the car, is shown at the top, in Fig. 3. Two lugs are forged to fit into the ends of the piece of tubing, and are drilled out to take the steering-knuckle pin. Each lug is fastened into the tubing by two bolts or pins, and the steering knuckle swings on the upright bolt through it. The steering knuckles are of bar steel, and are bent to shape and riveted to the steering-knuckle arms, and the tie-rod is bolted to them. This piece of tubing, which forms the tie-rod, has forked ends reinforced with sheet steel, bolted to the two steering-knuckle arms, as shown in the detail. The reinforcement consists of No. 12 gauge sheet steel, bent to a U-shape and soldered between the forks of the tube. One of the holes in the tie-rod should not be located finally until the chassis is set up, and the front wheels are tested to see whether they are lined up properly. When they are set parallel with each other, the tie-rod should be marked and drilled. A shorter length of tubing of the same size forms the drag rod, placed behind the tie-rod. One end of the drag rod is attached to the left steering-knuckle arm by a piece of ⅜-in. round iron, forged to a shape resembling a cotter pin, driven into the drag rod, and secured with cotter pins. The other end is flattened and drilled, and is connected to the arm on the steering column. The rear-axle detail, shown below, is, of course, much simpler.



In the Plan and Elevation of the Speedster are Shown the Long Ash Chassis Springs, the Brake Linkage, and the Steering Mechanism

Body

The framework of the body consists of five built-up formers, cut from ¾-in. hard pine to the shape and dimensions given in Fig. 5, and mounted on two long ash

frame members. Each former is made up of four or five pieces, held together by screws. The formers are held in place between the frame members by wood screws, and are reinforced by hardwood corner blocks. Two cross members are set in the underside of the frame members, as shown in Fig. 4. To each of these, near the ends, are bolted two of the 12 bent fittings. The washer plates used here should be of such length that they can be bent to a right angle, the bent portion to lie against the frame member and be bolted to it. The floor is made of ½-in. boards, screwed firmly to the top of the long frame members. On the underside of the floor, several ¾-in. boards should be screwed diagonally to the floor in such a way that they will strengthen the framework against shocks which would tend to make the frame collapse or fold up. Two light bucket seats, as used on speedster automobiles, will do very nicely. If these cannot be picked up cheaply in some garage, a satisfactory seat can be made from wood and canvas. The tops of the cushions should come about 8 in. above the floor.

The entire body of the speedster is covered with heavy-gauge tin (about XX), or No. 22 gauge sheet steel. It is put on in four sections, of the shape and dimensions given in Fig. 6. If the builder is unable to secure material in such large sheets, sections can be made of two or more pieces riveted together. The metal is bent over and attached to the formers and the frame with round-head wood screws, spaced about 2 in. apart. The fuel tank is mounted in this metal covering, just behind the rear seat. A metal tank, about 8 in. in diameter and 20 in. long will be suitable. The tank may be soldered tightly at one end to the metal covering, and the other end left loose, so that stresses due to the springing of the car frame will not be transmitted to the walls of the tank.

The body is mounted on the springs by means of two steel tubes, set under the cross members, as seen in Fig. 4. These tubes are bolted into the fittings on the body, and are held in place in the fittings on the springs by heavy cotter pins with washers, placed through their ends. These pins keep the tube from sliding endwise, but do not prevent the slight rotating motion which occurs whenever the springs bend. The rear tube extends out beyond the front one, and serves to anchor the brake bars, outside of which are similar washers and pins.

Steering Gear

As will be seen in the assembly, Fig. 4, and in the detail in the lower right-hand corner of Fig. 3, the steering column is a length of steel tubing, running from the second former, or dash, to the first former, or false radiator. Near the lower end is riveted a steel arm, the other end of which is bolted to the right end of the drag rod, in Fig. 3. At the ends of the steering column, two beveled hardwood blocks are fastened to the formers with wood screws. The tube is held in position lengthwise by cotter pins bearing against large washers.

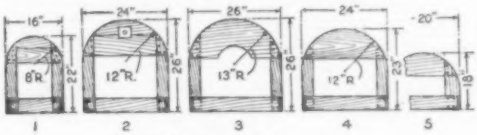


Fig. 5 DETAIL OF FORMERS

The Framework for the Body Consists of Five Built-Up Frames Which Give the Form to the Sheet-Metal Body Covering

Brakes

The installation of a brake on a vehicle of this type is not an easy problem, owing to the fact that there is no rear-axle shaft which turns with the wheels, and the motorcycle wheels used are not built to take a suitable brake drum. It is, of course, possible to mount drums on the rear

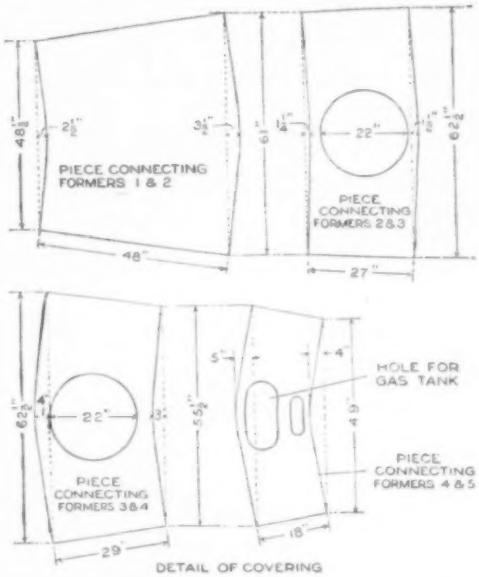


Fig. 6

Flat Patterns are Here Worked Out for the Four Pieces of Sheet Steel, or Heavy Tin, Required to Form the Body Covering

wheels, but it is believed that the brake mechanism illustrated in Figs. 4 and 7 will be easier to construct throughout, and will give satisfactory service. Two

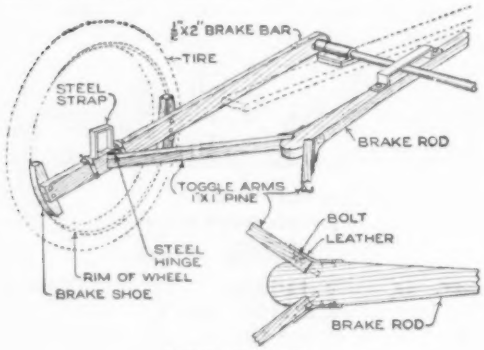


Fig. 7

The Brake Linkage, While of Somewhat Unusual Construction, Equalizes the Pressure on All Four Brake Shoes

brake bars, of ½ by 2 in. ash, seen in Fig. 7, have a 1¼-in. hole in one end, and are slipped over the end of the rear cross tube. The bars are strengthened by iron straps around this end, and the 1¼-in. holes must be slightly elongated to give some end play, so that the brake bar is free to move slightly endwise as the springs bend, but cannot work entirely loose from

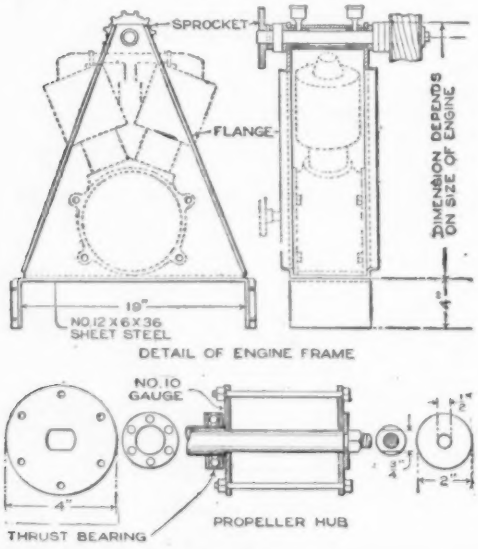


Fig. 8

The Engine Mounting is Not Worked Out in Detail, Owing to Differences in Engine Dimensions, but the Propeller Mounting is Detailed Fully

the ash spring. The brake bars are attached firmly to the rear axle by steel straps, as shown in Fig. 4 and detailed in Fig. 7. The straps must be able to slide along the axle for a distance of ½ to 1 in., depending on how much play is allowed in the brake linkage. To a point directly underneath the rear axle, on the brake bars, the toggle arms are attached by steel hinges. The other end of each toggle arm is attached, as shown in Fig. 7, to the central brake rod, which extends forward to the brake lever in front of the driver's seat. This rod should slide back and forth, guided by an iron strap hung over the tube which is under the rear seat. The brake control lever, seen in Fig. 4, may be placed slightly to one side, and must be provided with some sort of ratchet or locking mechanism, as indicated.

When the lever is pulled back, the toggle arms force the brake bar, which carries the brake shoes, against the edges of the steel rims on the rear wheels. The brake shoes should be lined with a good grade of automobile brake lining, and the shoes should be at least 6 in. long, to avoid excessive wear on the lining. The lining should be attached in the usual manner with copper rivets, and can be renewed by removing the straps from the rear axle.

Power Plant

A strip of sheet steel is laid across the rear end of the frame members, and lines are scraped on it along the outer edges of these members. The ends of the strip are bent down at right angles on these lines. This strip then forms the base of the engine mounting, which is detailed in Fig. 8. From a piece of the same sheet steel, the upper half of the engine mounting is bent to the form indicated. No dimensions are given for this piece, as they will be governed by the dimensions of the engine. The width between the front and rear triangular faces should correspond to the thickness of the crank case. The metal should be cut away, to allow clearance for any projections on the crank case. The engine is bolted down between the two triangular faces of the steel plate, the bolts being run through the same holes used in mounting the engine in the motorcycle frame.

The propeller is mounted on a piece of 1-in. shafting, which runs in two babbitt-lined bronze bearings set in a tube of suitable size, as indicated in Fig. 8. Holes are cut through the upper ends of the triangular steel faces, just large enough to drive the two bushings through. A short length of tubing is fitted between the flanges, in line with these holes, which,

in turn, should be accurately in line with the direction of travel of the car. The bushings are forced through the flanges into the ends of the tube, and fastened with machine screws. A large motorcycle sprocket is pinned, or keyed, to the forward end of the propeller shaft, and a smaller sprocket opposite on the crankshaft of the engine. The chain used is a stock motorcycle chain, shortened as required. Two flat surfaces are filed on the rear end of the shaft, as shown, to take the two disks, as detailed, which are mounted to form the hub of the propeller. A 1-in. thrust bearing is used between the propeller and the rear bushing, to take up the thrust.

The propeller used should be 4 ft. long and of 4-ft. pitch, with a maximum blade width of 6 in. It should be firmly bolted between the two steel disks, and mounted on the flattened portion of the shaft. To strengthen the power-plant mounting against the propeller thrust, it will be well to run two braces of light steel tubing from the flanges of the triangular steel faces down to the ash cross member under the rear seat.

Other Controls

Since there are no clutch and gear shift, the only other controls necessary are the spark advance and throttle on the engine. No attempt is here made to suggest the mechanism for these controls, since it will depend largely on the preference of the builder, and the type of motorcycle engine used. Two wires, from levers on the dash, or pedals on the floor, to the carburetor and the magneto, respectively, will largely take care of this feature.

Operation

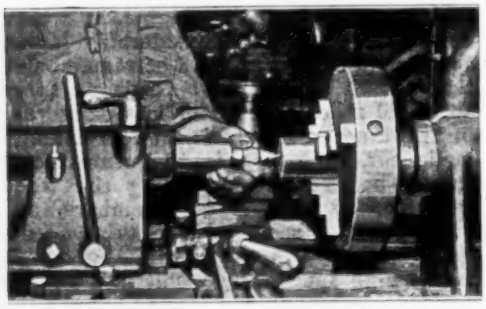
Assuming that the engine makes upward of 2,500 r. p. m., the gear ratio should be 1½ to 1; that is, the sprocket on the crankshaft should have just two-thirds as many teeth as the larger sprocket on the propeller shaft. The speed which can be expected from the car on a good road will depend on the workmanship of the propeller, as well as on the power of the engine, and the weight carried in the car, but it should not be less than 30 miles an hour, if the car is well built, and, with a good powerful engine, it should be possible to get a considerably higher speed than this. It should be remembered that travel on ordinary roads at speed above 30 miles is more or less dangerous in any kind of a vehicle, and in a handmade car, such as this, the utmost care should be used in inspecting the wood used for springs, frame members, and other parts, to see that it contains no defects, as failure in one of them in traveling at high speed may result in a serious accident. The only element of danger due to the air-drive system is that some person may come in contact with the propeller while it is in motion. The mounting of the propeller between the rear wheels so that it does not project beyond them minimizes this danger, but care should be used when turning the propeller to start the engine to see that nobody is in a position to be struck by it. In starting the engine, set the brake firmly, retard the spark, open the throttle only a small amount, and give the propeller a turn or two with the hand. It is important that the throttle be not opened wide in starting, as the driving thrust is exerted immediately when the engine starts, instead of being delayed until the clutch is engaged, as in an ordinary car. It is for this reason that the brake must be firmly set, in order to hold the car from starting under the initial thrust from the propeller. Unless the throttle is open too wide, this thrust will be easily held by the brake. The driver then takes his seat and releases the brake, opening the throttle farther, if necessary, to start the car. Accessories, such as a horn, speedometer, etc., may be added as desired.

MATERIAL REQUIRED

2 pieces of ash, 1 by 4 in. by 11 ft.
2 pieces of ash, ¾ by 4 in. by 11 ft.
2 pieces of ash, 1 by 4 by 40 in.
2 pieces of pine, ¾ by 8 in. by 6 ft.
2 pieces of pine, ¾ by 3 in. by 8 ft.
1 piece of pine, ¾ by 4 in. by 10 ft.
10 sq. ft. No. 12 gauge sheet metal.
45 sq. ft. No. 22 gauge sheet steel, or heavy-gauge tin, body covering.
1 sq. ft. No. 10 gauge tin, body covering.
1 piece No. 12 gauge seamless steel tubing, 35 in. long, 1¼ in. outside diameter.
3 pieces No. 12 gauge seamless steel tubing, 40 in. long, 1¼ in. outside diameter.
1 piece No. 12 gauge seamless steel tubing, 70 in. long, ¾ in. outside diameter.
1 piece No. 12 gauge seamless steel tubing, 60 in. long, outside diameter depending upon steering wheel used.
4 ft. bar steel, ¼ by 1½ in.
3 ft. bar steel, ¼ by 1 in.
1 pair bronze bushings, 1 in. inside diameter.
1 1-in. thrust bearing.
1 piece shafting, 1 by 14 in.
4 front motorcycle wheels, complete with bearings and axles, light-weight or standard.
1 light-weight automobile steering wheel.
2 light bucket seats.
Several light pieces of hard pine for brake linkage.

Centering Chuck Jobs Quickly in the Lathe

Lathe work held in a chuck may have a center hole drilled without removing the dead center from the lathe. Using a drill



By Countersinking a Chuck to Fit over the Tailstock Center, a Center Hole is Drilled Very Quickly

chuck as it comes from the manufacturer, countersink it to a 60° angle, so that it will fit directly over the dead center. Place a center drill in the chuck, hold the latter in place with the left hand, and with the right hand bring the tailstock spindle up until the center hole is drilled as desired.—J. J. McIntyre, Bridgeport, Conn.

Frauds Practiced in Selling Used Automobiles

Weird and devious are the business methods used by many used-car dealers, as well as by individuals who wish to dispose of decrepit automobiles. Camouflage, highly deceptive to the uninitiated automobile buyer, conceals broken and defective parts in the wares which are sometimes offered to the unsuspecting public, and there are times when even would-be experts are deceived.

When purchasing an automobile from a person who is not known to the buyer as being thoroughly reliable in his transactions, it is well to open the transmission case and examine the lubricant within; if it contains small particles of matter, examine still closer, and ascertain whether or not granulated cork has been introduced. Ground cork, such as used for packing grapes, is the old-time tonic for worn and noisy gears. It is needless to say that gears found "lubricated" with cork should be thoroughly inspected.

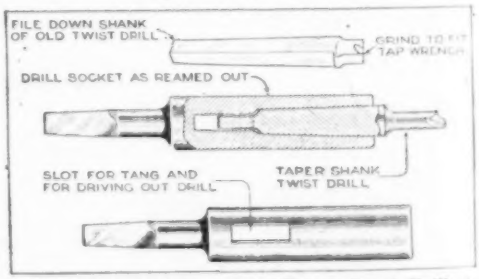
In cars where the compression is bad, castor oil seems to be the most popular demonstrator's aid. This is poured into the carburetor, and is difficult of detection once it enters the cylinders. Cars which are hardly able to pull themselves along in their normal state will, when treated with castor oil, go chugging down the road as if they had just been thoroughly overhauled. The oil forms a sort of gum under the heat of the motor, and temporarily seals the leaks around the piston and piston rings.

Another common stimulant is the use of ether or camphor in the gasoline. Many an unsuspecting motorist has wondered why he could not get the power from his motor as did the man who demonstrated the car. The "poor grade of gasoline used," is the explanation used to comfort such purchasers, and it should arouse suspicion whenever made. The practices cited above are only a few of the many, too numerous to mention. The best way to buy a used car is to buy from a person or firm who can be relied on, for personal or for business reasons, not to employ fraudulent methods.

Making Sockets for Taper-Shank Twist Drills

It is often necessary in the machine shop to make sockets for standard taper-shank twist drills, as when these drills are to be used in a bit brace. The principal job in making such a socket is to ream it out to the proper taper. Unless a reamer of the correct size and taper is at hand, it is necessary also to make the reamer. An easy way of doing this is here described.

The material used for the reamer is the shank of a broken drill, which is of the same size as those to be used in the socket. Cut off the tang of this drill shank, square the remaining part of the drill, above the shank, to fit a tap wrench, then dress down the shank to a square taper. This is done by filing four flats the entire length of the shank, until they



A Bit-Brace Socket, to Take Taper-Shank Drills, is Easily Machined by First Making a Special Reamer

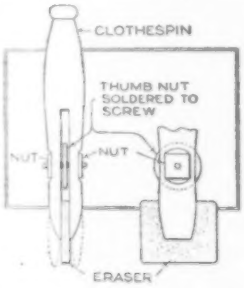
meet and form sharp edges. It is important in filing these flats that the diagonal

of the square, at any point in the taper, should be the same as the former diameter of the round shank; that is, one must file until the edges become sharp, and must then stop without further reducing the thickness. The square reamer thus formed is tempered to a good full-brown color, and is then ready for use.

The socket is made by turning and filing a piece of steel shafting to the shape illustrated, then drilling, in the lathe, a hole, which is afterward reamed in the vise, with this special reamer, to the proper size. The slot for the tang of the drill is cut out by drilling small holes, chipping, and filing. The making of the socket is not at all difficult after the reamer is provided, and the making of the reamer is a very simple process for anyone who can do fairly accurate filing.

A Clothespin Eraser Holder

All draftsmen know the strain on the fingers caused by using a small piece of eraser for a long time. A handle can be made by fastening the eraser between the lips of a clothespin and securing it with a screw, threaded right-hand on one end and left-hand on the other. The thumb nut is fastened with a little solder, after the screw has been placed in position, the outside nuts being threaded right and left-hand, respectively.—Abel Green, New York, New York.



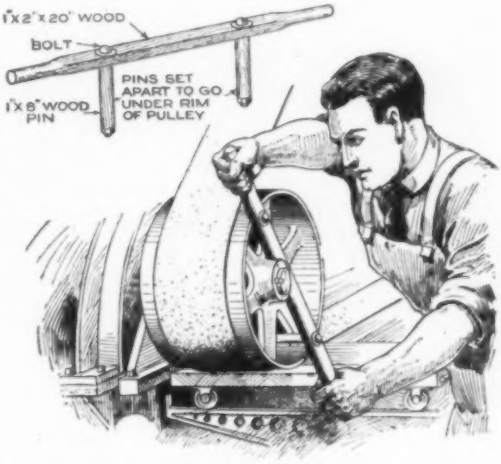
Opener for Crown-Top Bottles

An opener for a crown-top bottle may be made by driving an eight or ten-penny nail into the wall at an angle of about 45°, the head of the nail being lower than the point. To open the bottle, place the neck under the nail, catching the edge of the crown on the nail head. A sharp downward pull will remove the cap instantly.

¶ A small electric motor, for which no other use is at hand, can readily be fitted with a chuck on the end of the shaft, forming a chuck motor for driving small screws, drilling, tapping, and the like.

A Tool for Turning Machinery by Hand

A tool, such as illustrated, will be found very handy for the man who frequently has to turn by hand heavy machines, such as the sander shown in the sketch. The tool is made of hard wood, its dimensions depending on the size of the pulleys of the machines to be turned, but the dimensions given will prove suitable in many cases.—E. K. Wehry, Cedar Rapids, Ia.



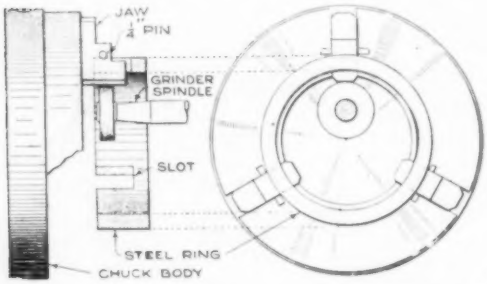
A Lever with Handles at Both Ends Facilitates the Turning by Hand of Pulleys on Heavy Machines

Powerful Screwdrivers

These two cranked screwdrivers are very simple to make. The type shown at the left is made from a standard screwdriver of the long-shank type, the round stock simply being heated and bent to the crank shape. The driver to the right is made of 3/8-in. round steel rod, and the handle is made from a door knob. The first type drives a screw very quickly; the second type is better for forcing home a very tight screw. These tools take up very little room in the tool kit, yet seem indispensable when once used.—C. H. Willey, Concord, N. H.

Grinding Jaws of Lathe Chucks

When the jaws of a lathe chuck of the "universal" type are out of true, they must be resurfaced with a grinding wheel. For

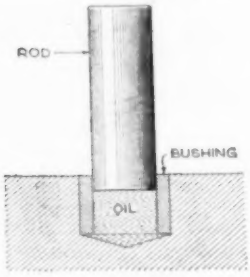


A Steel Ring Fitted over the Jaws of the Universal Chuck Holds Them in Proper Position for Grinding

this purpose, they should be forced back just as they are when in actual use, all lost motion and play being thus taken up. A good practical way of doing this is shown in the sketch. Through each of the jaws a pin is set, made of 3/16 or 1/4-in. drill rod. A steel ring is then cut out, having slots which fit over the jaws, enabling the ring to press outward against the pins. The ring is placed in position on the jaws, which are then screwed up just as if a piece of work was being gripped in the chuck. The jaws are thus properly held, with their faces clear for grinding.—Chas. Homewood, Ontario, Calif.

Driving Out Tight Bushings by Fluid Pressure

A toolmaker was confronted with the job of removing a bushing which was fitted very tightly in a blind drilled hole. There was not space enough at the bottom of the hole to get in a hook of sufficient strength to pull out the bushing. After several different methods had failed, the toolmaker fitted a steel rod quite accurately into the bushing, filled the hole with heavy oil, inserted the rod and drove it in with a hammer against the oil. The fluid pressure of the oil was transferred to the inner end of the bushing, and forced it out with very little difficulty.



Labor-Saving Chicken Roosts

It has been said that the success of a poultry keeper depends upon the condition of his roosts. There is a good deal of truth in this assertion, yet numerous poultry keepers fail in manure removal mainly because they have inconvenient arrangements. The equipment determines whether this chore is hard or easy. The following are simple plans which save time and trouble.

Assuming that the dropping boards are built up to a wall, as they are in a great majority of poultry houses, two arrangements are successful in operation and easy to introduce. The dropping boards are readjusted so that they are level or have a slight slope toward the wall instead of away from it. Next, wall apertures are made through which the manure is pushed with a hoe into a receptacle outside the house. One method is to make this opening a small manure door, 1 ft. or 18 in. wide and 8 in. high, in which case the outside receptacle may be a barrel equipped with a cover which will shed rain.

Another way is to prepare a wall opening, 4 in. high and as long as the dropping boards, emptying into a special manure box built onto the house. This space is left constantly open, or may be closed by a hinged board. The manure box is as long as the dropping boards, 2 to 3 ft. wide, and as deep as the annual production of manure dictates. It has a sloping roof lid, and the whole is covered tightly with roofing paper, to preserve the manure in a dry state and to keep out draft. It is emptied in the spring, or oftener if desired.

As well-preserved hen manure has a cash value of 75 cents to $1.25 a barrel in many towns and cities, such facilities as the foregoing are profitable investments aside from their convenience. The boards are cleaned with a hoe every day or two, at which time sawdust or dry earth is sprinkled lightly over the boards. The manure does not then adhere, and is readily removed.

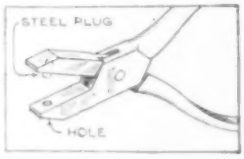
In contrast with plans which make daily removal easy are the practical arrangements made for the removal of droppings twice a year, in late fall and early spring. Where floor space is at a premium, as it is with a crowded flock, this method cannot be used. It saves considerable labor, however, and is gaining ground at present among commercial poultry men. The idea is, briefly, to dispense with dropping boards altogether. Beneath the roosts a

space equal in area to that ordinarily taken up by dropping boards is set off from the balance of the floor by means of boards built to form a shallow pen. At short intervals in damp weather, and as needed at other times, the poultry keeper sprinkles an inch or so of sawdust or other litter material over this dropping space. If this duty is observed intelligently, no ill-smelling mass will accumulate beneath the roosts. The hens will scratch there, and the mass, steadily growing deeper, will look very much like litter. It is removed with a wheelbarrow twice a year. A concrete floor is preferable for this dropping pen, though in no way indispensable.

Labor, with any style of dropping boards, is very much reduced by systematic applications of sawdust, lime, or other mulch, to prevent adhesion of manure to the boards. A pailful of such material should be kept near at hand, hanging from the side wall, or permanently suspended from a hook beneath the dropping boards.

Punch Made from Old Pliers

A punch for making holes in tin or sheet iron may easily be made from an old pair of pliers. The jaws should be annealed, and holes drilled, as shown in the illustration. A short plug, made of drill rod, is inserted for a perforator, and the jaws are tempered again. The plug should be short, and the hole opposite must be made slightly larger than the plug, to take care of the arc described by the plug when the tool is operated.—Fred Christensen, Columbus, Ohio.



Removing Automobile Valve Cages

Removing overhead-valve cages is often a difficult task. It may be accomplished much easier than ordinarily if a little kerosene is poured into each valve cage before starting work. Then, after removing the rocker arms and valve-chamber plugs, turn the starting crank until the piston begins the compression stroke. Continue to turn the crank very slowly until the compression forces the cage out. This should be done to only one cylinder at a time.—John G. Pope, Worcester, Massachusetts.

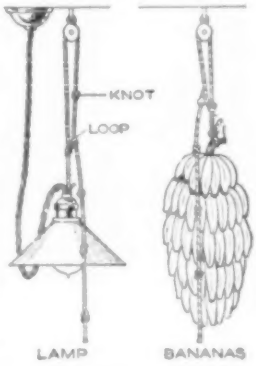
A Combination Table and Bench

A very useful article of furniture is a table, the top of which is attached in such a way that it can be swung up to form the back of a bench. A shelf underneath the table top then forms the bench seat, and it in turn forms the lid of a box in which magazines or other material may be kept. The pivots on which the table top swings may be wooden pegs, or steel pins, depending on the general type of construction used in building this piece of furniture.

The Same Object Becomes in Turn a Bench, a Table, and a Convenient Storage Box for the Parlor or Living Room

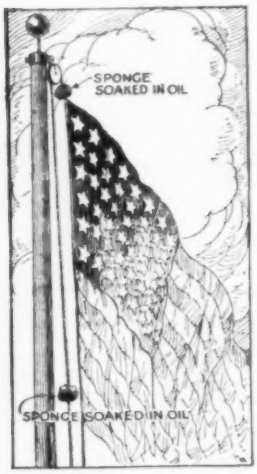
Simple Cord Adjuster

The height of any object suspended from the ceiling may be quickly adjusted by using the knot-and-loop method illustrated. A loop, tied in the cord near the object, catches on one of several knots tied in the other end of the cord, which has been passed over a pulley. Since these knots may be changed to suit any need, the method is adaptable to use with electric lamps, banana bunches, clotheslines, and many other objects.—Charles Brocksmith, Bicknell, Ind.



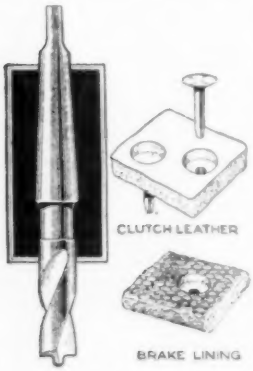
Flagpole Pulley Lubrication

The pulleys used on flagpoles are so exposed to weather conditions that they rust very quickly, and wear out the halyard rope by their roughness, as well as by the pulley remaining stationary instead of turning. This trouble may be avoided by tying soft sponges to the halyard rope, saturating them with light machine oil, and jamming them into the pulley block by hauling on the rope first from one side, then from the other, repeatedly. This insures the pulley being well oiled, and should be done about once a month.



Counterboring Drill for Clutch Leather and Brake Lining

In installing new brake linings and leather facing for friction clutches on automobiles, it is necessary to counterbore the brake lining, or leather, in order to let the rivet ends in below the surface, so that they will not come in contact with the metal friction surface. This work of counterboring is difficult for an inexperienced person to accomplish, because it is important that the hole must not be so deep as to weaken the fastening of the lining. A twist drill, ground as shown at the left of the drawing, will do this work very nicely. It is used in this way: After the leather or brake lining has been put in place, and the rivet holes made in it, lay it on a flat piece of iron on the drill-press table. Place this specially ground twist drill in the drill-press chuck, and start the point of it in the rivet hole. Drill down until the point touches the iron. With a little care, all the holes will thus be countersunk to the same depth. The length of the central point on the drill will, of course, depend on the thickness of the lining or leather.

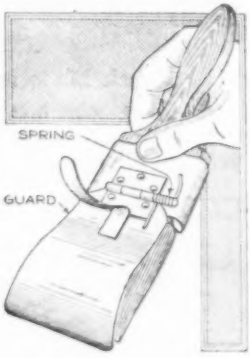


Fungus Razor Hone

Canadian woodsmen make a serviceable razor strop from the fungus growing on tree trunks. The fungus is stripped from the bark, and cut level on one side. By gluing it to small pieces of lath, a strop can be made which puts a very sharp edge on a razor. A short stroke is necessary, as most fungus growths are not more than 6 in. long.—James E. Noble, Kingston, Ont., Can.

Guard for Paintbrush

The amateur house painter is apt to overfill his brush, which means trouble when working on wainscoting or window sashes. An easily made appliance to remedy this consists of a zinc or tin sheath fitted tightly to the brush handle, and fastened by a hinge to a metal guard. The sheath can be slid up the handle far enough to leave the bristles projecting ½ in. below the guard, which must be of sufficient curvature to prevent contact with the bristles except at the lower end, where it presses against them. The hinge pin should project beyond the hinge at one side, so that a small coil spring may be used to hold down the guard, which is raised for dipping by a lug or handle made of a strip of heavy metal. Solder and small rivets are used in fastening the parts together. —James E. Moore, Portland, Ore.



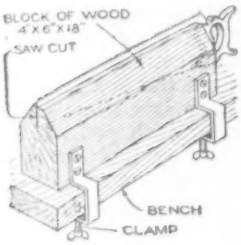
Driving Auto with Sheared Hub Key

A makeshift repair job on the hub of a light automobile was made by using a pipe wrench as a spare part. Owing to a sheared hub key, one of the rear wheels became loose from the floating axle, and ran free in the hub cap. The driver removed the cap, borrowed a pipe wrench from a neighboring farmhouse, and, fit-

ting it to the threaded shaft end, he fastened the handle with wire to one of the spokes of the wheel. On reaching home the slightly damaged threads were soon put in shape with a thread cutter.—Dale R. Van Horn, Lincoln, Neb.

Simple Wooden Block Forms Saw-Sharpening Clamp

A simple saw-sharpening clamp can be made from a block of wood, 4 by 6 by 18 in. A saw cut is made lengthwise in the narrow edge of the block. This should be deeper at one end than at the other. Two iron clamps, bent as shown in the drawing, are screwed to one side of the block, one clamp being placed at each end. To sharpen the saw, clamp the block to the top of the workbench and insert the saw, teeth up, in the slot cut in the block; then file as usual.—P. P. Avery, Garfield, N. J.



Straw Hat Protects Garden Plants

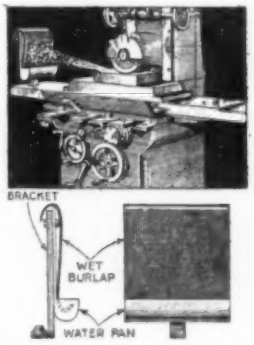
A discarded straw hat will serve in early spring to protect plants from frosts. Especially for city gardens, better results are said to be obtained with such a protector than with one made of metal. The hat is put over the plant, and a stone or other weight is set upon it to keep the wind from blowing it away.

Countersink Gauge on Key Ring

An inexpensive countersink gauge for flat-head wood screws employs sample screws, with the threaded portions cut off, and the remaining ends rounded so as to reduce wear on the pocket. Flat tips are soldered into the slots, with holes drilled to fit a key ring. The gauge is used to determine the proper depth to countersink for screw heads of the same size as those in the gauge.—E. Alpha Dean, Chicago, Ill.

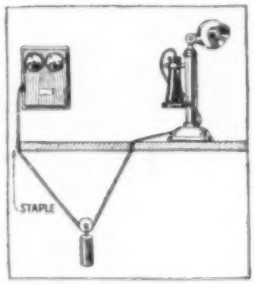
Dust Catcher for Grinder

A very effective dust catcher for surface grinders consists of an iron bracket, to which is bolted a broad piece of sheet metal, with a water pan or trough built on at the bottom. A piece of heavy cloth, or burlap, is hung over the sheet-metal surface, long enough to reach down into the water trough. The burlap soaks up the water like a wick, and is always kept wet. Emery dust and small metal particles thrown against it are caught and kept from flying around the shop.



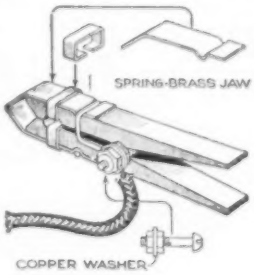
A Simple Telephone-Cord Adjuster

To prevent knots in a telephone cord, pass it through a staple and a hole drilled in the counter or desk on which the instrument stands, and hang a weight by a pulley from the cord, keeping it always taut.



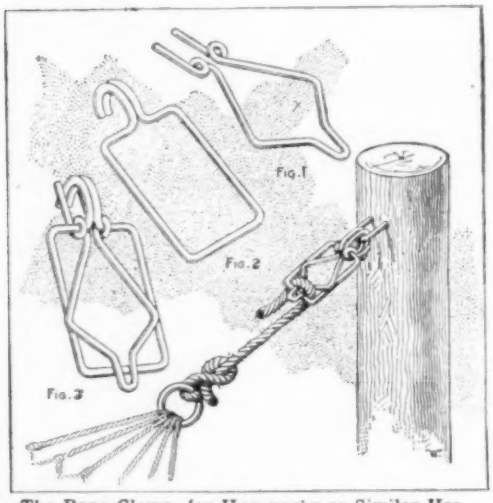
Spring Clothespin Easily Converted into Efficient Testing Clip

The advantages of using a testing clip which has large capacity and a positive grip are well known. Such a clip can be made from a spring clothespin by fitting spring-brass or bronze jaws under the spring on the clip, and slipping a binding post bolt through the spring coil for connections. The jaws are held firmly to the clothespin by straps, or bands, of the same metal, which fit into the grooves in the two halves of the clothespin.—Milton H. Shoenburg, San Francisco, Calif.



A Quick-Acting Rope Clamp

A rope clamp which will hold firmly can be made of wire in a very few minutes. The size will depend somewhat upon the



The Rope Clamp, for Hammocks or Similar Use, Holds Tighter as the Weight on the Rope is Increased

size of rope it is to be used with. It consists of two parts, both made from No. 3 gauge (1/4-in. diameter) steel wire, bent to shape. A diamond-shaped section, Fig. 1, with a tongue at one end and a loop at the other, and a rectangular part, Fig. 2, which has a loop at one end formed of the wire ends, make up the assembled clamp, shown in Fig. 3. The ends of the diamond-shaped piece are twisted around the shoulders of the rectangular piece. These ends should extend out horizontally at the sides of the hook formed by the ends of the rectangular piece. The illustration shows the clamp in use on a hammock rope. The diamond-shaped piece is raised, the hook placed over the staple, the end of the rope looped around the tongue of the clamp, and finally the diamond-shaped piece is lowered.—C. A. Black, Jr., Hightstown, N. J.

Rubber Sponge Cleans Wall Paper

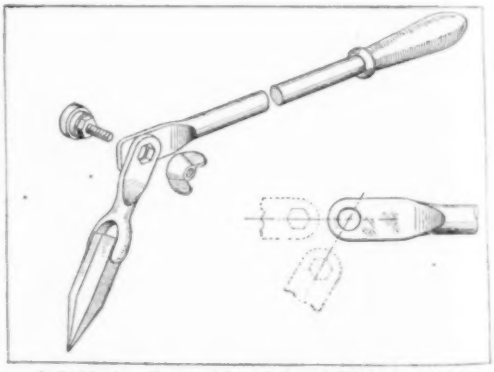
A rubber sponge, which may be purchased at five and ten-cent stores, will clean wall paper very nicely. It leaves no streaks or sticky rolls on the paper, requires no kneading, and is always ready for use; the dry sponge crumbs can be taken up quickly with the vacuum cleaner or brushed up with a broom, and they will not stick to the floor or tramp into the rugs. The rubber sponge can also be used to clean flat-painted walls and varnished woodwork, and to remove the smoke, dust, and "cloud" from polished dark-wood mantels or furniture. It is also good for cleaning picture frames, chandeliers, and other gilt or lacquered articles.—Wm. T. Grinstead, Columbia, Mo.

Tethering Breaks Hens of Sitting

One of the quickest and best ways of breaking hens of sitting is to tether them out of doors, where there is no chance to sit, and where the fresh air and freedom soon bring them back to normal again. The tether is simply a short stout cord, fastened to a short stake at one end and to a leather strap around the hen's leg at the other end. This strap is a short strip of leather with a hole in each end. It is placed around the hen's leg, and the end of the cord slipped through the holes and tied.

Soldering Copper Has Jointed Handle

One of the handiest tools in a certain machinist's kit is a soldering copper with a jointed handle. It was made from a regular shop soldering copper, by cutting the handle near the copper and flattening it for a short distance, then drilling and filing a hexagon hole. The same was done on the end of the handle rod, except that the hole was left round. Next, a special steel bolt was made, with part of the body filed to fit the hexagon hole. The two parts of the handle were then put together, and the bolt inserted so that the round part of the bolt fitted into



A Soldering Iron with a Jointed Handle may be Set at Various Angles

the round hole, and the hexagon body into the hexagon hole, the wing nut being placed on this end and tightened.

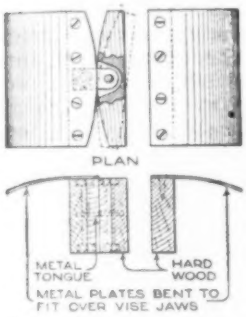
This permitted the handle to bend to any angle without turning the nut, which keeps the joint tight at all times.

Cup Grease Keeps Gaskets Soft

Shellac is often used on gaskets to make them adhere to the metal surface while assembling. Gaskets thus treated are rendered hard and brittle, and must be replaced when the parts are reassembled. Cup grease, smeared on the gasket, will serve the same purpose, and will keep the gasket soft and pliable.

Swivel Jaws for Holding Wood in Iron Vise

Auxiliary jaws for holding either flat or angular pieces of wood in an iron vise can be made from scrap materials. Cut three pieces of hard wood to the width and height of the jaw faces. Round off two of these on one side, and cut a mortise in the round face of each block, long and wide enough for a short swivel hinge made of a piece of strap iron with a hole drilled in each end. Insert the ends of the hinge into the mortises, and drive heavy steel pins, such as sections from large nails, through the two holes made in it. Cut two heavy pieces of brass, or other sheet metal, as wide as the vise jaws, and long enough to reach from the face edge of the jaw, back over the curve. Screw these pieces to the auxiliary jaws, one to the flat, plain piece, and the other to one of the hinged blocks. These metal strips are to hold the wood jaws in the vise when it is open. The swivel jaws thus made enable the vise to grip either flat or angular pieces of wood.—A. B. Nutting, Boston, Mass.

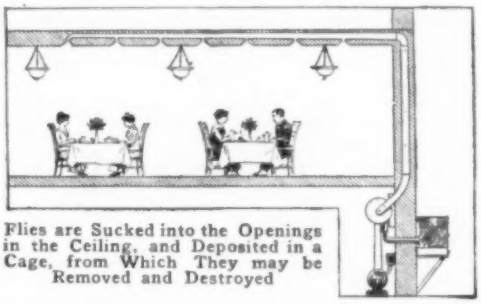


Knots in Pattern Lumber

When it is impossible to obtain lumber for pattern work which is free from knots, it is often possible to bore out a knot, plug the hole with a piece of the same material, and dress it off to a good finish. The plug can be glued in place and will not be found to cause trouble in most pattern work.

Vacuum Fly Catcher

A large restaurant made use of an interesting fly catcher. A 7½-hp. motor in the basement was used to drive an inclosed blower fan, with the outlet extending through the wall to the outside. A 10-in. pipe was connected to the suction end, and was carried up through the wall to the ceiling of the restaurant room. Here it branched into numerous funnel-shaped openings in the ceiling.

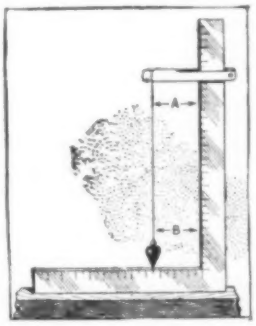


Flies are Sucked into the Openings in the Ceiling, and Deposited in a Cage, from Which They may be Removed and Destroyed

A cage of wire screen surrounded the outlet opening and a drawer was placed underneath the cage. When the motor was running, the flies were drawn into the funnel-shaped openings through the 10-in. pipe, and deposited in the screen cage out of doors. They were removed when the drawer became full. Before the cage was built over the outlet, the owner observed that the flies blown out by the catcher returned instantly by way of the front door.—H. S. Rich, Cromwell, Conn.

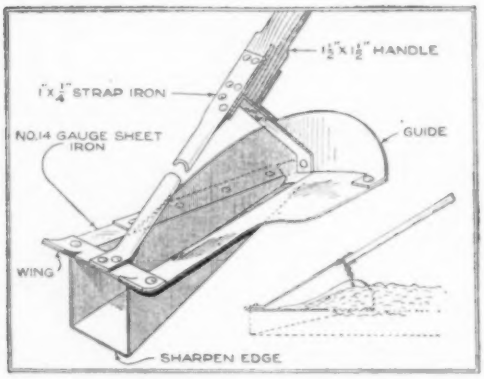
Square Used as Level

Any carpenter's square, together with a plumb bob, can be used to form a level. Hold the plumb bob, or fasten it with a clamp, to one leg of the square held upright. When the plumb bob hangs so that the distance A is equal to distance B, then the surface is level in the direction tested. A clamp for the purpose can readily be made from a stick of wood by sawing out a slot and driving a nail or screw through the slotted end.—Paul Gorton, Big Rapids, Mich.



Plow for Garden Furrows

Using a hoe or small garden plow for making furrows, in which to plant potatoes or set out plants such as cabbage or



Furrows for Potato Planting can be Made by Using a Plow Made from Sheet Iron

tomato, is a tedious task, and does not always produce the proper kind of furrow for the particular thing being planted.

The furrow plow shown in the drawing was designed to dig rapidly in soil that had been plowed and harrowed. With it a furrow of the proper width and depth can be cut nearly as rapidly as a man can walk and guide the plow, and with little more exertion. The size of the plow can be made to cut the size of furrow required.

For the body of the plow, use No. 14 gauge sheet iron. The cutting edge is of the shape and size of the finished furrow, and the metal tapers from this edge to the rear end of the implement. Wings, 3 in. wide, bent over at the top of the sides, regulate the depth to which the plow cuts. Strength is obtained by putting a strip of 1 by ⅜-in. iron across the front edges of the wings, which should be turned up to keep them from digging into the ground. A curved sheet-iron guide is riveted to one of the top edges, to throw the dirt to one side of the furrow. The handle is made from hickory, or oak, 1½ in. square and 4 or 5 ft. long. It is fastened to the plow with a piece of strap iron, 1 by ¼ in., in front, and another extending back to the curved wing behind. The front strap may be curved as shown, to make it more rigid. When the front edges have been filed sharp, the implement is completed.

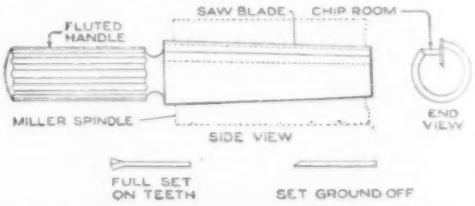
¶ For many working sketches made in pencil, plain long-hand writing is much to be preferred to hurried lettering.

Removing Enamel from Magnet Wire

Many amateurs have trouble while winding coils of various kinds with enameled magnet wire, because of the difficulty in scraping off the enamel without breaking the wire. One way of removing the enamel is to pass the wire over a Bunsen gas flame several times, until the enamel melts and drops off. If it is impossible to do this, the same result may be secured by dissolving the enamel in amyl alcohol.—Peter J. M. Clute, Schenectady, New York.

Reamer for Cleaning Taper Holes

When the arbor of a milling machine, or the center of a lathe, is found to be out of true, the condition may be due to small pieces of waste, or chips of metal, on the surface of the taper hole. To remove these, it is desirable to have a tool that will work this dirt off firmly and completely, without damaging the accuracy of the tapered hole. A tool which fulfills these requirements can be made from a stick of soft, white pine of suitable size. One end of the stick is turned to fit the taper hole. In its surface, exactly parallel with its length, is inserted a piece of thin hacksaw blade, the teeth of which have been ground off flush with the sides of the blade. The slot in which the saw blade is inserted is cut by the blade itself, after the set has been thus ground off. The blade is inserted, teeth down, and should project about 1/32 in. The edge is then carefully straightened with an oilstone, and backed off very slightly. The final fit to the taper hole is made by inserting the tool and tapping it lightly with a hammer, thus forcing the saw teeth farther into the wood, until the blade projects only about .01 in. from the shank. A



A Hand-Operated Reamer will Clean Out Dirt Which Sticks Tightly in the Spindle of a Lathe or Milling Machine

space should be cut at one side of the blade to accommodate the chips, or other particles of dirt, which may be scraped off. A fluted handle is provided, by which the tool is turned. It should be with-

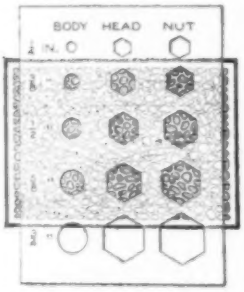
drawn in such a way that the dirt will be largely removed with it, and any loose dirt should afterward be blown out of the hole.—Joe V. Romig, Allentown, Pa.

Iodine for Scratches on Furniture

Scratches on dark-oak furniture may be greatly improved in appearance by carefully painting the scars with iodine, using as many coats as necessary to produce the desired depth of color. When this is dry, go over the whole piece of furniture with a good furniture polish.—John P. Robinson, Santa Fe, N. Mex.

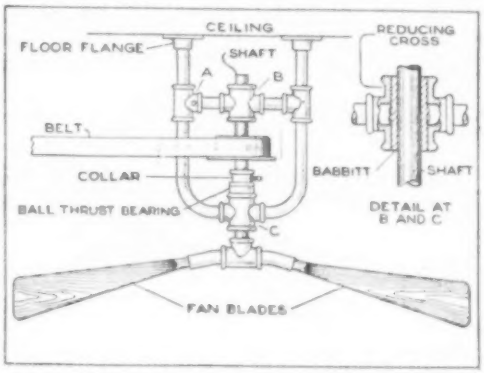
Draftsman's Bolt and Nut Ruler

Draftsmen who frequently have jobs involving a large number of bolts and nuts of standard sizes, will find a transparent ruler, like the one illustrated, to be a great timesaver. The sizes of bolts most frequently used are selected, and a circle of the same diameter as the bolt is laid out, with hexagon figures in line with it, representing the standard sizes of the head and nut, respectively, for a bolt of the diameter indicated. When this has been done for as many different sizes as desired, cut out the holes with drill, and file to the shape marked. By placing the point of the pencil inside of these holes, with the ruler laid on the drawing at the proper place, bolts and nuts of these sizes can be drawn very quickly.



Ceiling Fan for the Shop Made of Pipe Fittings

A great convenience in the small shop in hot weather is a rough but powerful fan which can be driven by a belt from a small pulley, set anywhere on a countershaft or main shaft. The fan here shown is cheap and durable. It is made of common pipe and fittings, except for the fan blades, pulley, and bearings. The vertical shaft is a piece of pipe which should be finished in a lathe if possible, or at least smoothed off for a few inches at two points. It works in bushings made by pouring babbitt into the reducing cross fittings, these being plugged with clay or wood so that the babbitt does not run out

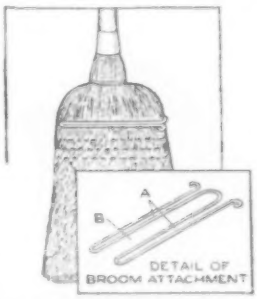


The Fan is Made Almost Entirely of Pipe Fittings, and Driven from Any Shaft on the Ceiling

through the small ends of the cross. A worn ball thrust bearing from an automobile, and a collar with a setscrew, support the weight of the fan. The fan blades are cut from wood, screwed into short pieces of pipe, and fastened with pins if necessary. In assembling the frame, it is necessary to file away the threads at A and fasten with a pin; other connections can be made in the usual way. The belt should pass around one side of the frame, in order that its pull will come in the direction where the frame is strongest.—J. H. Norrell, Augusta, Ga.

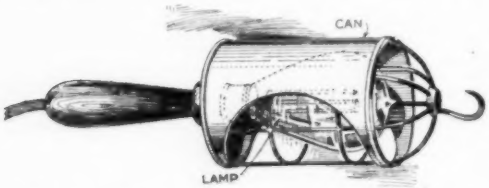
Attachment Fastens Cloth on Broom

Housewives often find it necessary to fasten a cloth on a broom for use on walls or floors. By the use of a piece of wire, bent as shown in the sketch, the cloth may be quickly attached or detached. Stiff spring-steel wire, nickelplated, is the best to use, but spring brass, if somewhat larger, will also be found satisfactory. The central opening B, between the wires, should be only wide enough to make a tight fit on the broom. The two wires on each side, between which the cloth is placed, should have a very narrow space, A, between them, except when sprung apart to insert the cloth.—Wayne W. Leyrer, Atlantic City, N. J.



Trouble-Lamp Reflector Made from Tin Can

In the ordinary trouble lamp used around machinery, the glare from the lamp interferes with clear vision and the



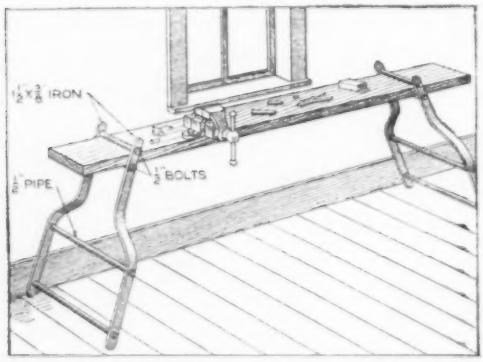
A Tin Can Forms a Cheap and Efficient Reflector for the Shop Trouble Light

operator is more or less "blinded." To overcome this objection, a garage man constructed a reflector from a tin can, in the manner shown in the sketch. Both ends were removed from the can, one entirely and one only partially, and a portion of the side cut away, leaving an oval opening.

The remaining tin was slipped over the wire protector on the lamp, and gave excellent results both as an eye shade and as a reflector.—L. B. Robbins, Harwich, Massachusetts.

Portable Bench for Plumbers

A plumber's bench, which is easily carried from place to place, can be made from four pieces of iron bar, eight long



A Portable Plumber's Bench is Formed by Inserting a Plank between the Rungs of the Two Trusses

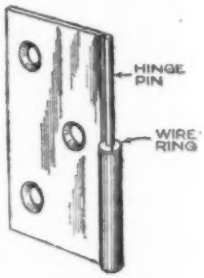
bolts with nuts, and eight short lengths of pipe. The iron legs are bent as shown in the sketch, and four 5/8-in. holes are drilled in each, for the rungs. The legs are put together with the long bolts and nuts, using the pieces of pipe as spacers. When completed, the sides of each truss should be 12½ in. apart at the top, and 18 in. at the bottom. The two top rungs are 4 in. apart. It is an easy matter to carry these trusses to the job and to insert a length of 1½ or 2-in. plank, which can nearly always be found on the premises. The bench thus made is strong, light, and durable.

Bearing Races Tightened by Solder

When the race of an automobile ball or roller bearing works loose, the surrounding metal may become so badly worn that even a new race fits loosely. In such a case the worn surface can be built up with solder until it makes a tight fit, and the bearing can then be forced into position with a hardwood punch. Loose dust caps can be fixed in the same manner.—Fred Page, Winfield, Kan.

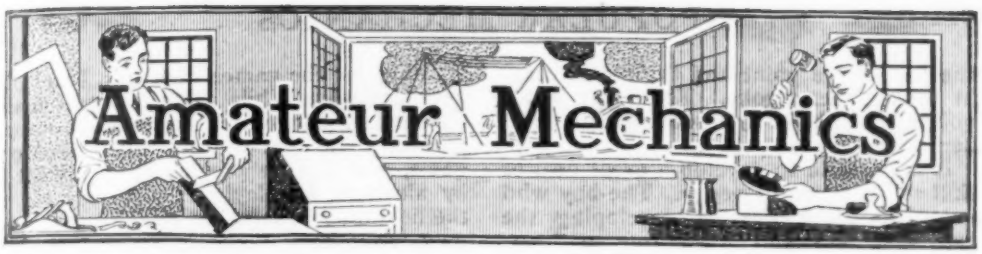
Remedying a Sagging Door

Sometimes a door will bind against the sill, due to wear in the hinges and to sagging. A good way to remedy this trouble, without trimming the door or sill, is as follows: Remove the door and slip a small ring made from soft-iron wire over each hinge pin, as shown in the sketch; when the door is replaced it should clear the sill. If one ring on each hinge does not take up the wear, then another can be added to each pin. A quick way to make the rings is to wind the wire on a rod a little larger in diameter than the hinge pins, and then cut through the coil lengthwise with a hacksaw. Each turn of the coil when removed from the rod will be a split ring. The saw slot can be squeezed shut with a pair of pliers.—J. A. Weaver, Baltimore, Md.



Wire Prevents Rubber Tube from Breaking When Bent

Rubber tubing used for joining pieces of glass tubing is liable to crack at the bends, or to flatten and cause an obstruction. To keep a joint from closing, make two loops a few inches apart in a piece of wire, taking care that the loops have the same diameter as the inside of the tube, and insert the wire at the place where the trouble occurs.—Stanley Trier, Maywood, Ill.



"Peggy"—an Exciting Outdoor Game

By J. T. BARTLETT

AMONG the old American games for boys which are not as well known as they should be is "peggy." It has the advantage that it can be played by any number of boys. It requires nothing that must be purchased; the few objects required are readily made out of wood. As a preparation for the better known games of tennis and baseball, peggy is admirable training. The pasture, the field, the little-used road, the vacant lot, all are satisfactory playing grounds. The surface need not be level, though it should be smooth enough to permit running over all parts of it. The objects necessary for playing the game are a bat, a wooden projectile called the peggy, and the "home."

To make the home, two stakes, 1 ft. long, each cut off square at the top, are driven into the ground until they project from it scarcely at all. They are placed 18 in. apart. Next, a crossbar is nailed to them, 18 in. long, 1½ in. wide, and 1 in. thick. The bat should be from 2 ft. to 2½ ft. long. It should preferably be made of a round piece of ash, 1¼ in. in diameter, but any other wood, not heavier than ash, will give satisfactory results. To make the peggy, a piece of wood, either hard or soft, should be cut out about 4 in. long and 1½ in. square. The four edges should be rounded off, and the piece should be tapered from the middle, almost but not quite to a point at each end. The edges at the ends should then be rounded off also; smoothing down with sandpaper makes a better job, although this is not essential. These objects can be made by almost any boy in an hour's time. Only one peggy and one bat are required for each game.

The Game of Peggy, Played with Objects Which can be Cut Out in an Hour's Time, Is Capable of Providing Real Excitement

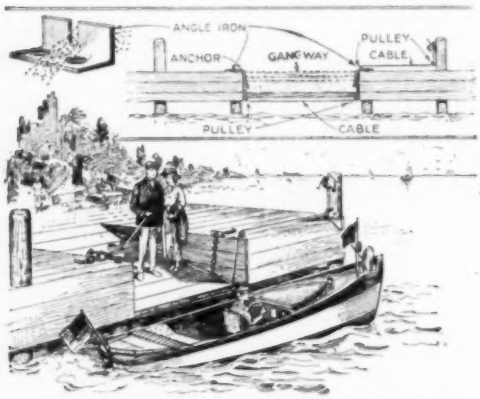
The game is played in this way: One boy is "in," while the rest are "out." The counting out, as in many other games, determines which player shall first be in, or wield the bat. The player selected lays the peggy against the home in the manner illustrated, with one of the ends protruding above it. He strikes this upper end a carefully adjusted blow with the end of the bat, and the peggy bounds into the air, whirling about continuously. Before it falls to the ground, he strikes it a powerful blow with the bat, just as is done in baseball. Depending on his ability or strength, the peggy will travel 10 yd. or 30, or perhaps 60. The other players each try to reach the peggy wherever it falls in the field, and the first reaching it throws it at the home. To mark more clearly the position of the home, the batter should place the bat upright in a hole directly back of the plate as soon as he has struck the peggy. He then retires while the peggy is thrown at the bat. If the player who has thrown the peggy hits the bat with it, he goes in, and his achievement in hitting the bat scores him five points. If he misses, but the peggy stops within a bat's length of home, he still goes in, but without the five points. If he misses by more than one bat's length, each length to the peggy counts

the batter one point and the batter stays in for another stroke. The game is 100 points; the player first scoring this number being the winner.

It is possible to develop a great deal of skill at the game of peggy. The boy who exercises his ability in developing the proper strokes, and in learning to throw the odd-shaped projectile accurately, will not only be able to score high, but will be giving his eye and his arm excellent training for the games of tennis, baseball, and football. While there is some small element of danger in the game, it is no greater than that of any other outdoor game, and can be practically all avoided by alertness in playing. The players in the field must keep their eyes on the batsman while he is preparing to strike, and the batsman must not stand near the plate after he has delivered his stroke and set up his bat as the target.

Dock with Runway Adjustable to Various Levels

One of the faults of the ordinary dock or pier, used by pleasure boats or commercial craft, is that the gangway by which the boat is boarded is not adjustable to different levels. The result is that the gangway is too high for some boats and not high enough for others. If affected by tidewater, the gangway may not be right for the same boat at different times.



The Adjustable Gangway can be Raised or Lowered to Suit Any Size of Boat or Any Water Level

The illustration shows a dock and gangway designed to fit all boats, within certain limits, at any stage of tide; the gangway can be raised or lowered to suit the conditions.

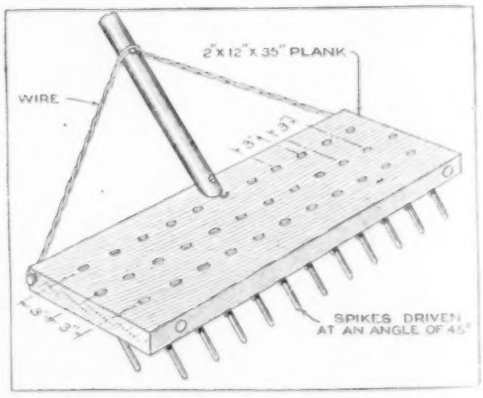
This gangway is a part of the flooring of the pier, cut to whatever width is most convenient, and hinged at one end to the main part of the flooring. At the free end, two pulleys are bolted to the under timber of the gangway, and a wire cable, fastened at one end to the dock, is threaded through the pulleys, over another pulley on the other side of the gangway, and secured to the drum of the windlass on one of the pier timbers.

After the gangway has been raised or lowered to the desired height by the windlass, it is held at that level by chains bolted to each side of the gangway, which fit into angle-iron catches on the permanent flooring of the dock, at either side of the gangway. Each catch is a short piece of angle iron, into which a notch has been sawed. It is only necessary to slip a link of the chain into this notch to hold the gangway at the proper level.

The size of the windlass required will depend entirely upon the size of the gangway and the height to which it is to be raised or lowered. If possible, all fittings should be of galvanized steel, to resist the tendency to rust. Such a dock will add much to the efficiency and convenience of a landing place.

A Homemade Garden Harrow

After spading some bits of ground for seed beds, some means of reducing the clods to finely pulverized soil is necessary. While a rake will serve the purpose, much better results will be obtained in a shorter length of time by using a homemade garden harrow. A piece of 2 by 12-in. undressed plank, 3 ft. long, serves as the

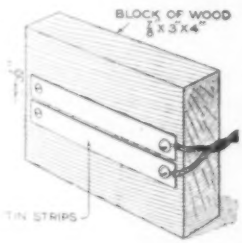


Spaded Ground may be Leveled, and the Soil Pulverized, by Using a Harrow Made from Spikes and a Piece of Plank

tooth holder, and gives the necessary weight. A broomstick is set into one edge of the plank at an angle of 45°, and is braced by wires twisted between it and the corners of the plank. The teeth are 60-penny spikes, driven through the plank in holes previously bored for them at an angle of 45°. The spikes should be 3 in. apart in the row, and the rows 3 in. apart, and "staggered," that is, with the spikes of one row set to come opposite the spaces between the spikes of the row next to it. Other large nails may be used to keep the plank from splitting, by first boring holes for them in the edge of the plank.—W. W. Irvine, San Fernando, California.

Flies Killed in Electrical Trap

The sketch shows an electrically operated flytrap, which kills the flies instantly. Two strips of tin, ½ in. wide and 3¼ in. long, are mounted with a space of 1/32 in. between them on an oak block, 3 in. wide, 4 in. long, and ⅞ in. thick. Electrical connection is made from the house-lighting circuit to the screws which hold the tin strips to the block. For bait, a little sirup is spread on the tin strips. The block should be set up edgewise, and is best protected by a wire cage of some kind which will allow the flies to reach the tin strips, but will keep persons from touching it, or metallic objects from making a short circuit. The flies, attracted by the sirup, move from one strip to the other, thus making connection through their bodies, and are so electrocuted.—Frank E. Menehan, Monroe, Wis.



One-Man Pressure Sprayer Uses Ordinary Force Pump

The great difficulty in washing automobiles, where no water under pressure is available, is to operate the sprayer pump, and at the same time use a sponge effectively. A large water and air-tight barrel with both heads intact will be required. A faucet or valve, to which a hose can be attached, is inserted in one of these heads. The barrel is then placed, with the faucet down, upon some sort of platform. A hose is attached to this faucet, and to the nozzle of the force pump. After the valve is opened, water should be pumped into the barrel, until it is about three-fourths full. The valve is then closed, and the hose removed from the nozzle of the force pump. To use the barrel as a force spray, it is only necessary to put a nozzle on the hose and open the valve at the bottom of the barrel. The air, which is compressed by pumping the water into the barrel, forces the water out when the valve is opened, thus making an effective spray. All these operations can be performed by a man working alone.

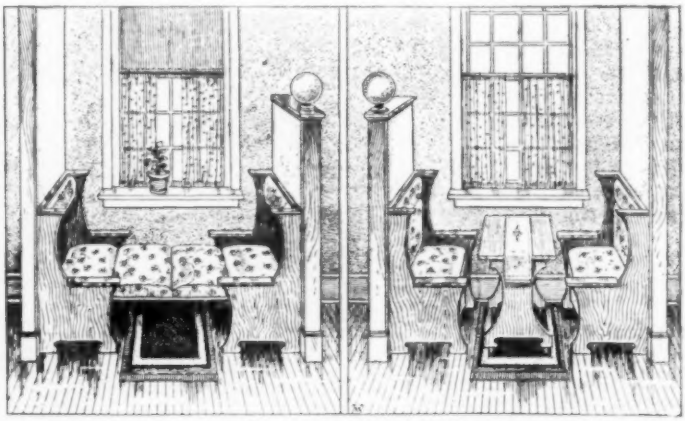
Water from a Well or Cistern is Used with All the Convenience of a City Pressure System

Goblet Made into Dinner Bell

The dinner bell in the photograph was made from scraps picked up around a jewelry shop. The bell proper is the upper part of a broken goblet. The remaining portion of the standard was ground off smooth, and a hole was drilled through it. Through the hole extends a small brass bolt, to which is fastened an ivory handle taken from a broken nail file. The clapper and chain are part of a watch chain. While the tone of the bell is not loud, it is easily audible, and the appearance is very attractive.—M. M. Bakula, Havre, Mont.

Breakfast Room and Sleeping Compartment in the Kitchen

A good night's rest, and a comfortable breakfast in bed, may be enjoyed without leaving the confines of the kitchen, if the proper furniture is installed. The important feature of the plan is the use of two benches which are convertible into a bed, and a table which may be easily moved from between them to some out-of-the-way corner.



A Convertible Breakfast Room and Sleeping Compartment Makes an Attractive Addition to the Kitchen, and Economizes Floor Space in a House

The cushions on the high-backed seats, or benches, are simply wooden boards, covered with cloth, and stuffed. The cloth covering is tacked to the back of the boards near the edge, and the filling stuffed in with a stick. Spring cushions may be used, if preferred. The seats are fastened to the floor with small iron brackets.

Between the benches, in the daytime, is the table, which is made of polished boards. It moves easily, on noiseless casters. A table, 3 ft. wide, 3 ft. 6 in. long, and 26 in. high, is just right to use between the benches, which are 38 in. apart, having seats 18 in. wide, 4 ft. long, and 18 in. from the floor. The removable back cushions are 18 in. wide and 4 ft. long; the permanent ones, 6 in. wide and 4 ft. long.

For privacy at night, the bed, formed of the two benches, with the back cushions supported in the opening between them, may be curtained off from the rest of the room, or may be hidden by a permanent half partition.

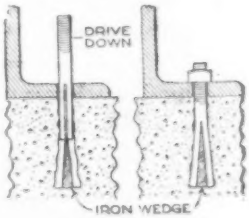
The expense of the whole depends upon how elaborate it is made. The materials may be either cheap or expensive, and the conveniences few or many. A very cozy reading place may be made of the compartment, by installing the proper reading light. This may be accomplished by wiring a flush receptacle into the wall between the two benches. Since this socket can be used for any electrical appliance, there is no reason why a toaster, grill, and coffee percolator should not be used to make the breakfast getting as easy as possible. Of course, it also allows the use of heating pads, foot warmers, and curling irons.—H. A. Shearer, Chicago, Illinois.

Wood Block Keeps Door from Rattling

Wind currents from open windows often cause doors to rattle at night, and when latches are adjusted to cure the trouble, they generally become too tight or too loose at some other season of the year, when the wood swells or dries out. A simple remedy is obtained by fastening a small piece of wood at the bottom of the door frame, so that the corner of the door will bear against it just before the latch engages. The door may then be latched by a very slight pressure, and the block holds it from rattling.—F. G. Treat, East Orange, N. J.

Expansion Bolt Easily Made from Ordinary Bolt

An ordinary bolt is readily made into an expansion bolt by the method illustrated. Cut off the head of a bolt of the proper length, and slot it with a hacksaw for a distance of 2 or 3 in. from the end. Drive an iron wedge part way into this slot; then drop the bolt into the hole in the brick or concrete. The hole should be somewhat larger at the bottom than at the top, so that the bolt will take a better hold. Drive the bolt down with the hammer as far as it will go; if the wedge and hole are properly shaped, an expansion bolt of great strength will be formed.—H. S. Rich, Cromwell, Conn.

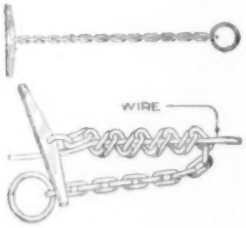


Keeping Pictures Straight on Wall

Nothing looks worse in a room than to see several pictures tilted slightly to one side. It is surprising how easily pictures shift when hung in the ordinary manner. If, instead, the picture is first hung facing the wall, then turned around without being taken down, it will not shift from its proper position. Turning the pictures gives the cord a twist which creates sufficient friction to keep the cord from sliding. This method can be used, regardless of whether the picture is hung from a molding or from a hook screwed into the wall.—S. B. Royal, Baltimore, Md.

Chain Used as Wire Grip

A short piece of chain, with a ring at one end and a crossbar at the other, makes a very satisfactory wire grip. It is wrapped around the wire, as shown, and the end of the bar, resting against the chain, keeps it from unwinding when the pull is applied to the ring. If the chain slips a little at first, twist it more tightly around the wire, and it will soon take hold.—A. S. Thomas, Amherstburg, Ont., Can.

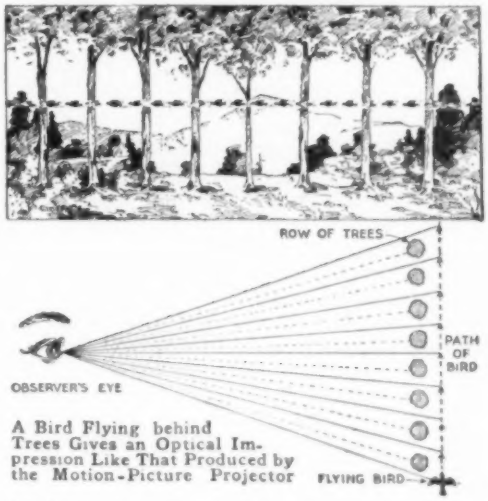


The Flying-Bird Illusion

A bird flying so that trees are between it and the observer often gives to the human eye an illusion of continuous flight. Hunters declare that although a grouse flies among several trees when the bird presents a shot, still they can see the bird easily every foot of the way through the tree trunks.

Much like the illusion of motion that the motion-picture film presents to the eye, is this illusion of continuous flight presented by the flying bird among trees. In the case of motion pictures, 16 successive pictures each second are thrown upon the screen. Between each picture is an equal interval where no picture is shown; that is, during each second there are 16 periods where a picture is shown and 16 intervals where no picture is shown, while the shutter is closed and a new picture pulled into place.

Now suppose that during practically one-half second of time the bird in the diagram flies through behind eight trees, the trees being spaced a foot apart. Obviously there are eight times when the bird can be seen by the human eye, while there are eight intervals where trees hide the bird. Still the eye "sees" a continuous flight of the bird, because each successive image melts into the next, just as in motion pictures. Even if the trees are not equally spaced and are more numerous, still the illusion of continuous flight will be present.

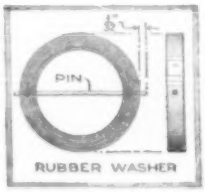


A Bird Flying behind Trees Gives an Optical Impression Like That Produced by the Motion-Picture Projector

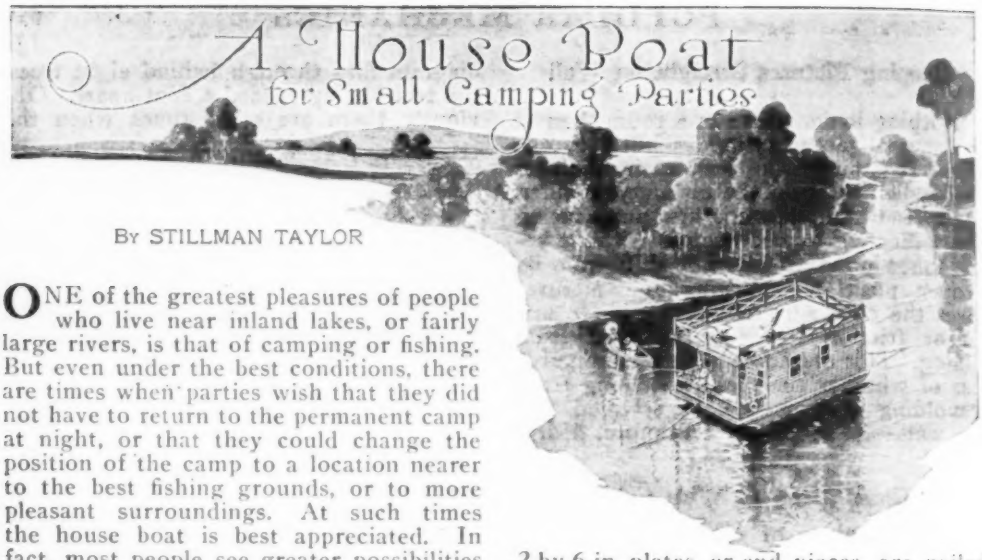
Many times hunters are deceived into believing that they should be able to kill a flying bird among trees, when actual facts prove that so many trees are in the way that the bird escapes easily. A bird might just be passing behind a tree as the shot reached its path; the human eye would see the bird all the time. But one can't fool a gun—it cannot "see" a bird when it is behind a tree, so a miss is the result.—F. E. Brimmer, Syracuse, N. Y.

To Keep Washers in Hose

When a hose is left uncoupled the rubber washer is likely to be lost. To avoid this, put a pin through the washer in the manner shown, allowing 1/32 in. to project at each end and cutting off the remainder. The washer will then stay in the coupling until worn out, for the projecting pin engages the coupling threads and prevents it from getting loose.—Francis W. Nunenmacher, Berkeley, Calif.



A House Boat for Small Camping Parties



By STILLMAN TAYLOR

ONE of the greatest pleasures of people who live near inland lakes, or fairly large rivers, is that of camping or fishing. But even under the best conditions, there are times when parties wish that they did not have to return to the permanent camp at night, or that they could change the position of the camp to a location nearer to the best fishing grounds, or to more pleasant surroundings. At such times the house boat is best appreciated. In fact, most people see greater possibilities in a week of house-boating than they do in one of the ordinary camp life.

To be practical, a house boat must be as comfortable as possible, and still be easily moved, by either a small power boat, or, in cases of necessity, by a row-boat. The boat here described is designed for a small party of three or four, and is made as light as is consistent with safety and comfort. In comparison with its conveniences, and the possibilities it opens up in the way of summer enjoyment, the cost is very low. Of course the cost depends largely upon what the owner cares to spend on it, for it may be equipped simply or expensively.

Since lightness is a first requirement, spruce or cedar should be used throughout, although other woods will serve the purpose where weight makes no particular difference.

The hull is 20 ft. long and 12 ft. wide, built of boards 1¼ in. thick and 6 in. wide.

The edges of the planks used in the sides and bottom are beveled, so that a narrow V-shaped groove is left on the outside of the seam when the planks are placed together. This groove is to hold the calking. It should not be more than ⅛ in. across at the widest part. Some people prefer to cover the hull with galvanized iron, or even painted canvas, but the calking is perfectly satisfactory, although it takes longer to do.

After the sideboards are cut to dimensions, they are nailed to the 2 by 3-in. ribs to form the completed side of the hull, as shown in the side and bow views. The two sides are then set up in proper relative position to each other, and the 2 by 6-in. plates, or end pieces, are nailed across the ends of the longer planks. The plates must be beveled at the edge that fits against the first bottom plank, to form a V-groove with it, for calking. The bottom planks can then be beveled, and nailed on, care being taken to get them as tightly together as possible. After the bottom is entirely planked, the center keelson is nailed in place. This is necessary to keep the bottom planks from springing.

All seams, or water-tight joints, should be painted with red or white lead, and calked. This is done by forcing oakum into the V-shaped grooves with a calking iron and a mallet. The seams must be packed tightly with the oakum, but if too much force is used the iron will be driven through the seams, which must then be patched with a batten on the inside. When the seams are nearly full of oakum, they are filled with putty and painted. All nails should be driven in with a set, and the holes puttied. The hull should then be given a coat of red-lead paint inside, before the house is erected upon it.

For the studding, use 2 by 3-in. stock, but for the rafters, and the floor joists, 2 by 4-in. pieces are necessary. The flooring, or decking, which is best made of tongue-and-grooved lumber, should be laid fore and aft—from bow to stern—and the studding nailed to it. The rafters should be set into notches cut in the plates.

Ordinary siding makes a very good-looking house boat, but any material will do. If the extreme of cheapness is desired, the sides may be boarded up part way only, and heavy canvas curtains used

when necessary in rough weather. Shiplap and tongue-and-grooved lumber have both been used effectively.

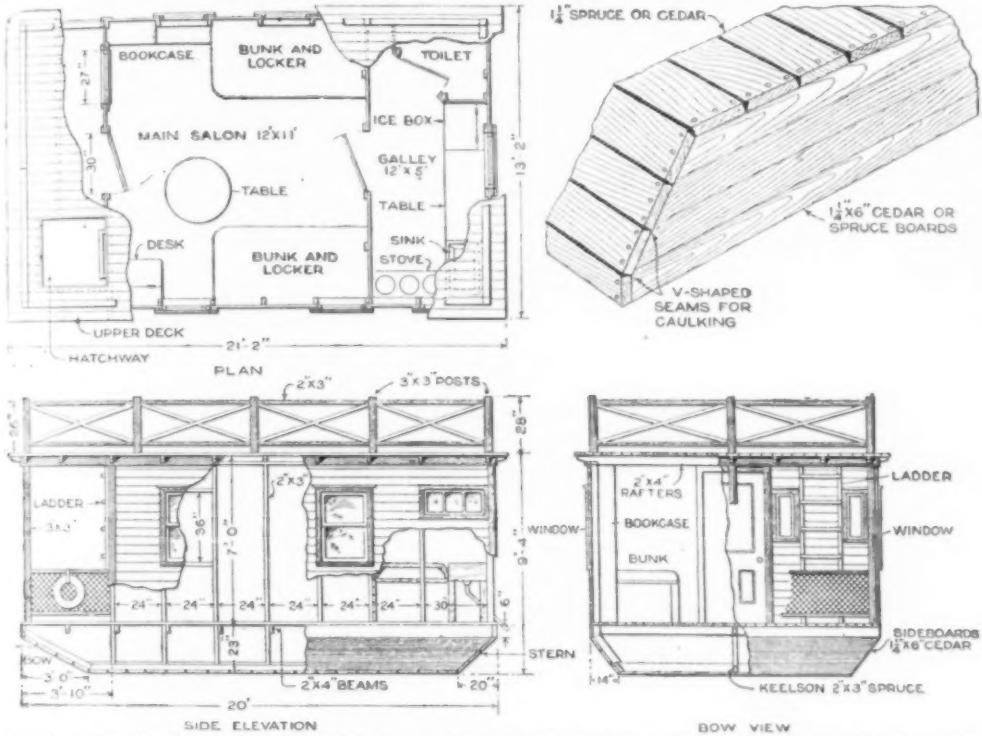
For the roof, which is also the upper deck, tongue-and-grooved lumber should be used, the joints being painted as the boards are laid, to make a water-tight job. A covering of 12-oz. canvas, laid in wet paint, will improve the rain-shedding qualities of the roof, especially if the seams of the canvas are lapped at least 2 in., and the whole is given three or four coats of paint. This gives the boat a good appearance, and makes a very durable roof.

Posts for the porch railing are toenailed to the roof decking. If an awning is desired, six of the posts should be hollow, so that longer posts, for awning supports, can be slipped into them. It is such refinements as this that add to the pleasure obtained from the boat. The added enjoyment makes the expense entirely worth while.

Access to the roof is obtained by installing a ladder on the wall of the house, leading from the front porch to the roof, through a hatchway. A railing around this opening will be a great help in climbing up or down the ladder, and may prevent serious accidents.

For the side windows, the ordinary check-rail sash are best, but the front windows should slide between the jambs. The large kitchen, or galley, window should be hinged to open outward, being held at any angle by an ordinary casement fixture consisting of a rod and thumbscrew. The small sash are hinged at the top to swing out, and are also fitted with casement fixtures.

The interior arrangement depends largely on the wishes of the owner. Bunks, about 6½ ft. long and 3 ft. wide, with storage space under them, are standard equipment for a house boat. Cots, which can be folded and stowed away in the space under the floor, bring the sleeping capacity up to as high as six persons, or even more, if use is made of the front-deck porch or the roof. The galley should be fitted with an ice box, a table, an oil stove, and a sink. Two pumps at the sink may be used to provide wash water from the river or lake, and drinking water from a tank in the hull of the boat. A toilet



The Building of a House Boat Which Is Convenient for a Party of from Two to Six Persons Requires Only a Few Hours of Careful Work, and Materials Which Are Not at All Expensive, When One Considers the Many Hours of Enjoyment It Makes Possible Each Season

compartment, equipped with a marine toilet, using a pump for flushing, is a great convenience.

Tongue-and-grooved lumber, and a light door of any kind, may be used for the partition between the galley and main room, or salon.

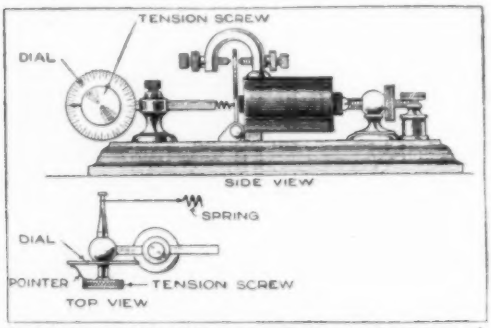
The house boat should be painted inside and out. If the interior is finished in panel effect, and stained a dark brown, there will be no need to repaint each year. A good color scheme for the outside of the boat is white, trimmed with green.

For mooring the boat, two 40-lb. stockless anchors should be used. The mooring lines should be of 1-in. manila rope, each line being at least 75 ft. long. They may be led through regular bow chocks, and the ends fastened to cleats screwed to the floor, or a ringed eyebolt may be inserted in the side of the bow plate, 12 in. from each end. This must be done before the flooring is laid.

There is hardly any limit to the amount of pleasure to be obtained from the use of this house boat. It is large enough to house an ordinary camping party, and is not at all hard to move around. Even a very small power boat will tow it against a moderately swift stream. This same boat, or a small rowboat, serves as a tender and boat to fish from. The owner will find that the hours spent in building the house boat will pay well in returns of health, pleasure, and ability to entertain his friends.

Tension Indicator for Relay

In connection with certain experiments, it is often necessary or desirable to have some method of determining, comparatively at least, the tension on the armature of a relay. This is an advantage when the relay has to be set at a different tension for each experiment. For this purpose, the knob of the tension screw can be fitted with a pointer that moves over a stationary dial, as shown in the illustration. The dial is laid out with compasses on thin Bristol board, or heavy paper, and glued to a disk, cut from thin brass, having a hole in the center to allow the tension screw to pass through. The disk is soldered to the rod supporting the tension screw, it being necessary to file away one side of the enlarged end of the supporting rod to get a good seating for the disk. The pointer, cut from brass, is soldered to the back of the tension screw. The pointer should be on the zero point when the tension on the spring is at a minimum. With this device, it is possible to reset the spring to any previously determined tension.—Thos. W. Benson, Philadelphia, Pa.



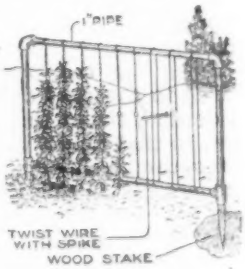
By Adding a Dial and Pointer, a Relay may be Adjusted to the Varying Tensions Throughout a Series of Experiments

Using a Camera Upside Down

Photographers are sometimes confronted by obstructions in the line of view, which would give no trouble if the camera could be operated a few feet higher up. This difficulty has generally to be faced when working in a crowd, where there is no opportunity of mounting to a higher location, and under such conditions it is handy to have a camera with its mechanism so constructed that it can be used upside down. The operator locates his subject in the finder by holding the camera over his head.

Twisted Wires Support Plants Nicely on Trellis

A very satisfactory sweet-pea trellis can be made by stretching wires on a frame of 2-in. hard wood or 1-in. pipe, the length of the frame being the same as the length of the rows. The wires should be placed loosely about the frame, as shown, then tightened by twisting them with a spike. A trellis of this kind can be used for several years, and if desired can be removed at the end of each season.—J. F. Campbell, Somerville, Massachusetts.

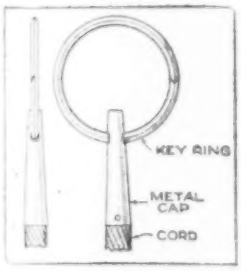


Protector for Book Covers Made from Envelopes

A cover for a pamphlet of ordinary size can be made by fastening two envelopes together. The adhesive flap of one of them is pasted to the back of the other, from which the corresponding flap has been removed. The address sides form the outside of the cover, and the pockets face each other on the inside. The fly-leaves of the pamphlet are then thrust into the pockets, and the book is complete.—George L. Michel, Jersey City, New Jersey.

Use Key Ring at End of Fish Stringer

An ordinary rope fish stringer which has a metal needle on one end, and a ring on the other end for holding the fish from falling off the string, can be improved by the use of a key ring instead of the plain ring ordinarily furnished. Since the key ring can be readily detached, the fish can be dropped directly off the end of the cord, where they have been hanging, and need not be pushed to the other end of the stringer, as ordinarily done, and taken off one by one over the large needle.—Alfred Sirrine, Holland, Mich.



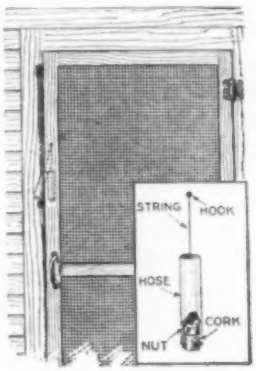
Tobacco Smoke Locates Roof Leaks

Leaks in a roof may admit a large quantity of water without always being easy to locate, and in such a case tobacco smoke is a reliable detective. Fill an ordinary tin can with tobacco stems, after cutting a hole near the base about the size of a dime. Take it into the room where the leaks give trouble and insert the nozzle of a small pair of bellows into the hole in the can. Light the tobacco at the bottom and work the bellows, while an assistant goes onto the roof and chalks the spots where the smoke issues. A few puffs of the bellows will bring it out in thick clouds.

Tin flashing placed under the leaky shingles will make a satisfactory repair job, and a little ventilation will soon remove the odor of the smoke.

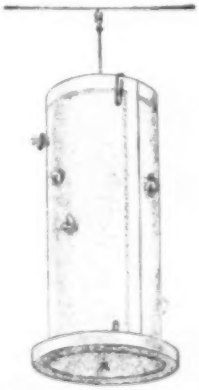
Cushion Hanging from String Prevents Screen Door from Slamming

Slamming screen doors can be prevented very easily by the use of a short piece of old rubber hose. The piece of hose is fastened by a string, which extends through it, and is tied to a small cork inserted in the lower end of the hose. An old steel nut, resting on the cork, will serve as a weight to make the hose swing out. The string is attached to the door, near the knob. When the door is closed by the action of the door spring, the piece of hose will be thrown out by centrifugal force, and caught between the door and the jamb, thus cushioning the shock. As the door rebounds slightly, the hose cushion falls into its natural position directly under the screw by which it is attached, and the door then closes easily and quietly.—E. L. Howard, Springfield, Ohio.



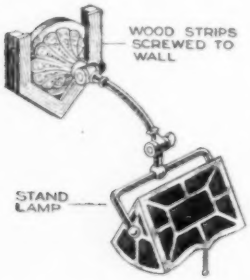
Hang the Fly Paper Out of the Way

A practical way of using sticky fly paper is to hang it from the ceiling, where it is out of the way, and near one of the favorite alighting places of the flies. The paper should be rolled into a cylinder with the sticky side out, paper clips being used to hold the ends together. Since the sticky coating will slowly drip from the bottom, some means of collecting this must be provided. The cover of an old tin pail may be used. Punch a small hole in the center of the bottom. Thread a stout cord, which has a knot tied in one end, through this lid. To hang the paper in place, set the cylinder on the lid, pass the cord through the cylinder, and tie it to a small hook or screw eye on the ceiling.—A. J. Viken, Waterloo, Ia.



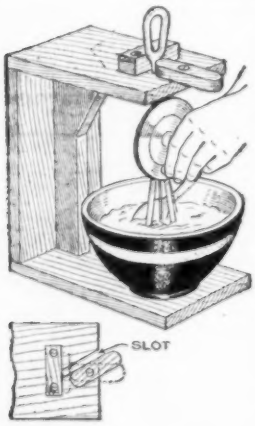
Device to Hold Reading Lamp on Wall

A simple device makes it possible to use an electric stand lamp also as a bracket light at the head of a bed or couch. Narrow strips of wood, joined in the shape of a half hexagon, are screwed to the wall. Wider strips of wood of the same length are screwed on top of these pieces, forming a groove in which the stand of the lamp fits and is held firmly. A lamp that is provided with a hinge where the globe is fastened to the standard, and also where the rod is fastened at the base, is the best kind to use. It can be adjusted to any angle by a person reading on the couch or bed. If the bracket is made heavy enough, an electric fan may be used in the same manner as the light.—Florence L. Clark, McGregor, Ia.



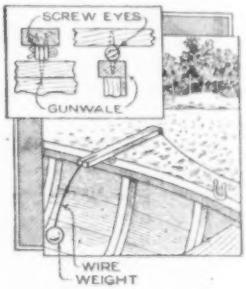
A Holder for the Egg Beater

Cooking recipes often call for the stirring or beating of the contents of the mixing bowl while another ingredient is being added slowly. Since it is otherwise impossible for one person to hold the bowl and at the same time turn the crank, a holder for the beater is desirable. The base may be made any size, but 8 by 12 in. will be large enough for ordinary mixing bowls. An upright of suitable length supports a crosspiece, 6 in. square. A slot is cut in this crosspiece at one end, just wide enough to admit the handle of the beater and hold it snugly. Two wooden blocks are screwed on the top of the crosspiece; one fastened with two screws at the inner end of the slot, and the other fastened with one screw, forming a button, at the edge of the board. In use, the mixing bowl is placed on the base, and the egg beater slipped into the slot and locked against the stationary block by turning the button against the handle. The egg beater can then be turned with one hand while the ingredient is added with the other.



Self-Acting Fish Jigger for Boat Fishing

In good fishing waters, one man can catch a large number of fish in a comparatively short time by putting out several lines. The difficulty about such fishing is that he cannot keep the lines constantly agitated, so that the bait will not appear lifeless to the fish, and cannot tell when he has a bite, except by pulling up each line separately. The jigger shown in the sketch will enable him to do both easily. A piece of wood, 15 in. long and 2 in. wide, serves as the lever. Two screw eyes are inserted, ½ in. apart, about 6 in. from one end. One end of the fishline is attached to the end of the stick farthest from the eyes. A piece of spring wire, which has a weight upon the end of it, is fastened to the other end of the stick. The jigger is pivoted to the gunwale of the boat by passing a cotter pin through the screw eyes in the stick, and another placed in the gunwale of the boat. The weight should be just sufficient to balance the stick horizontally when the fishline is in the water. It should not be allowed to touch the side of the boat. Any motion of the boat tends to upset the balance of the lever, thus rocking it and moving the bait in the water. When a fish pulls at the line, the lever is given a jerk, which notifies the fisherman that this line needs attention. Several such jiggers fastened to the sides of the boat will keep a fisherman busy.—L. B. Robbins, Harwich, Mass.

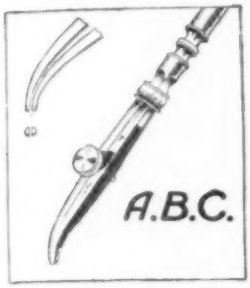


Inner Tube Makes Handy Pail

A 12-in. section from a large inner tube, with one end cemented shut, and the other cut like the lip of a pitcher, makes a very handy pail for filling the radiator when out on the road, as it takes up very little space in the car.

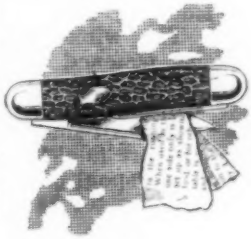
Free-Hand Lettering Pen Made from Old Ruling Pen

A ruling pen may be converted into a lettering pen by bending a 25° turn in it, the angle being formed as illustrated. The temper must be drawn, the bend made with round-nose pliers, and the points ground to a semicircular section. The edges can be trued on an oilstone. It is not necessary to retemper the pen. The device is very handy, and easier to fill and clean than many pens manufactured for free-hand lettering. The drawing gives an example of the work done by a pen like the one described.—Chas. P. Chalker, Ottawa, Ont., Can.



To Open a Pocketknife Easily

When it is found difficult to open a pocketknife without damaging the finger nail, slip a piece of good-quality paper under the blade, as shown, and pull steadily.

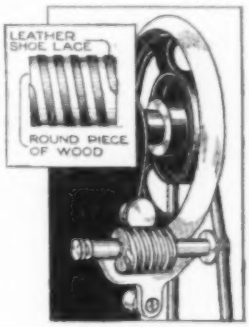


Alarm Clock Hung on Costumer

The feature of this costumer is that of supporting an alarm clock. The attachment consists of a piece of band iron bent into the shape of a hand sickle. What would be the handle of the sickle is screwed onto the costumer, while at the other end is fastened, with a nut, the hook that holds the clock. The costumer makes a very serviceable piece of furniture for a bedroom, and, properly adjusted, this extra weight at the top does not affect its stability. The diameter of the circle into which the band iron is bent must, of course, be large enough to accommodate the clock and hook.—C. L. Meller, Fargo, N. D.

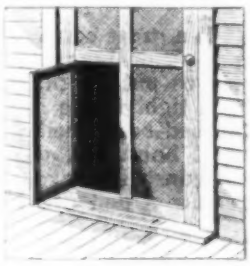
Razor-Sharpener Attachment for Sewing Machine

The illustration shows a novel type of razor sharpener, which is made to be used on a sewing machine. It consists of a round piece of wood, of the same length as the bobbin used in the sewing machine and having ends shaped to fit the center of the bobbin winder. This can readily be attained by mounting the block on one of the spare bobbins as a center or core. Around the outside of the wooden block is wound a length of leather shoe string, which is treated with one of the pastes or sharpening compounds made for use with razors. The razor, or blade, can be held in the fingers against the leather, or a special holder can be made, designed to take whatever type of razor is used.—E. Stumpf, Jersey City, N. J.



Small Door within Large One for Use of a Dog

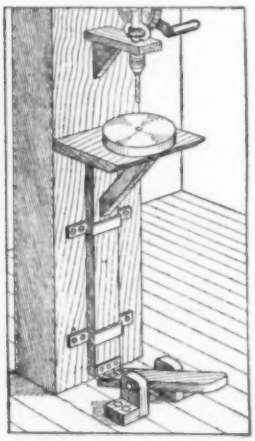
In a household where the dog was the pet of the family, one of the panels of the screen door was converted into a small door for the dog's special use. The small door was mounted on double-acting hinges, so that it would open in either direction. The springs in these hinges should be strong enough so that when the whole door is open, the small door will open with it, and will not be constantly swinging back and forth by the action of the wind upon it. The device is much appreciated by the dog, and also saves time and trouble for the members of the family who formerly had to let the dog in and out.—W. W. McLean, St. Louis, Mo.



¶ Stopping up cracks with plaster of Paris will keep away mice.

A Drill Press with Adjustable Table

Where a hand drill, or breast drill, is mounted on a column to form a drill press, a convenient feed mechanism can be constructed, to be operated by a pedal. The iron straps should fit without much play, if accurate work is to be done, but the trunnions of the pedal should move loosely in holes somewhat wider than they are high, so as to allow for the necessary slide. The advantage of the pedal control is that both hands are left free, one to turn the crank, and one to hold the work, if necessary.—Wayne W. Leyrer, Atlantic City, N. J.

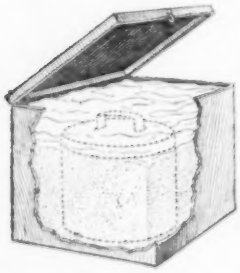


Match Scratcher on Bottom of Pipe

Cut several notches close together on the bottom of the bowl of a briar pipe. A match scratcher will thus be formed, which is always ready for use when the pipe is to be lighted.—J. L. Phillips, Tiffin, Ohio.

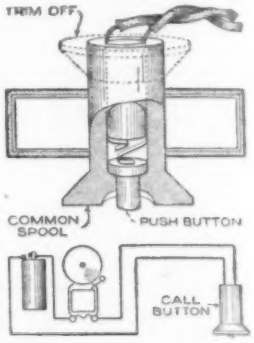
Keeping Food Hot for a Picnic

It is a great convenience when unpacking a picnic lunch to find the food hot, ready to put on the table. A large box with a tight-fitting hinged lid, fitted up as described below, will keep food warm for several hours. About 5 or 6 in. of hay, or sawdust, is packed into the bottom of the box. Upon this is set a 10-qt. water pail, and sawdust or hay is packed tightly around it to within 1 in. of the top. A good tin cover must be provided for the pail. A mattress, or pillow, stuffed with hay or sawdust, is made to fit on top of the cover of the pail, and to fill the remaining space in the box. After the food has been brought to the desired temperature, the kettle, or container, in which it was cooked, is set inside of the pail, which is then covered. The pillow is put on top of the pail, and the box lid fastened down tightly by means of a hook, or catch. Thus packed, the food may be taken to the picnic grounds, and will require no further attention until meal time.—S. Leonard Bastin, Bournemouth, Eng.



Call Button Made from Spool

A neat and handy call button, for the sick room or the shop, can be made from an ordinary spool. The hole is enlarged from one end almost to the other, and a push button is fitted, so as to work freely in the enlarged hole. A plug is then made, which fits quite tightly. On one end of this plug are the two contact springs, of thin spring brass, and the connecting wires are laid in small grooves made along opposite sides of the plug. The wires may be fastened to the brass contacts with solder, or by means of small screws set into the plug. Before final assembling, the lower end of the spool should be countersunk, to give room for the thumb in pressing the button, and the flange at the other end should be trimmed off with a knife.—Harold E. Benson, Boulder, Colo.



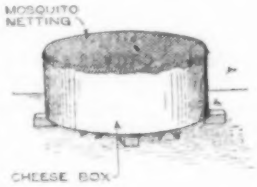
How to Make Gummed Stickers

Gummed labels, or stickers, can be made very easily in the home. All that is necessary is the paper which is to be gummed, a smooth sheet of celluloid, and a bottle of mucilage.

The sheet of celluloid is cleaned thoroughly, and the paper is coated on the back, evenly, with somewhat thick mucilage. It is placed, mucilage side down, against the celluloid sheet, and the two are pressed together; not hard enough, however, for the pressure to squeeze out any of the liquid. The mucilage is then allowed to dry, after which the sheet can be stripped off the celluloid, and will retain the coat of gum. The sheet of celluloid must be larger than the sheet of paper to be gummed, and after use it should be cleaned thoroughly with warm water.

Effective Flytrap Made from Cheese Box

A simple and inexpensive flytrap can be made from a cheese box. Remove the bottom from the box, leaving just the hoop, and tack a piece of mosquito netting over the top. Smear the inside of the hoop, for about 3 in. up, with a thin paste made of molasses, or honey, and flour. Spread a cloth on the table and set the hoop on it, with three small blocks, 1 in. thick, under the edge, as indicated in the illustration.



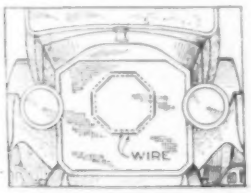
The flies will be attracted by the sweet paste and crawl under the bottom, up, and inside. As each fly gets its fill it will fly up against the mosquito netting. When a large number of flies are in the trap, simply give the hoop a push sideways to throw it off the blocks, then gather up the four corners of the cloth about the trap and carry to the nearest water, where the flies can be drowned.

Canceled Checks Replaced in Checkbook

In an office, which had experienced trouble in straightening out its checking account at the bank, the expedient was adopted of pasting the returned canceled checks back onto the stub in the checkbook from which they were drawn. This method shows at a glance just what checks are still out, and has been found very convenient.—L. E. Turner, Hartford, Connecticut.

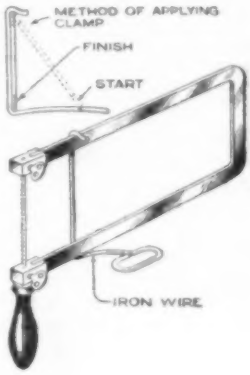
To Prevent Fan from Striking Radiator

A motorist who experienced trouble on the road from his fan striking against the radiator, made an efficient temporary repair by means of some pieces of heavy steel wire. He threaded the wire in and out through the spaces in the radiator, to form two figures, as illustrated. In this way, the blades of the fan were prevented from striking the radiator structure until a place was reached where the fan could be repaired. —Roe McKinley, Longview, Tex.

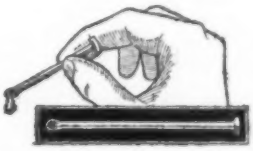


Scroll-Saw Attachment Aids the Young Workman

Children who like to use the scroll saw, often have difficulty in springing the frame and clamping in the saw at the same time. With this attachment, made by merely bending a piece of stiff iron wire to shape, the difficulty is removed. The saw blade is first fastened at one end only, and the wire clamp is then fitted over the frame, holding it compressed, while the other end of the blade is placed in the hole and clamped with the setscrew. The wire clamp is then removed, and the saw is ready for use.—J. G. Zimmerman, Milwaukee, Wis.



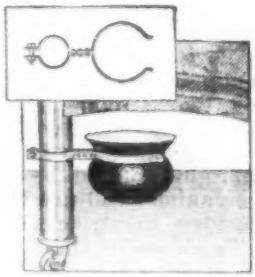
Medicine Dropper from Lamp Globe



A glass rod from a tungsten lamp, with the end rounded in a flame, is useful as a dropper.

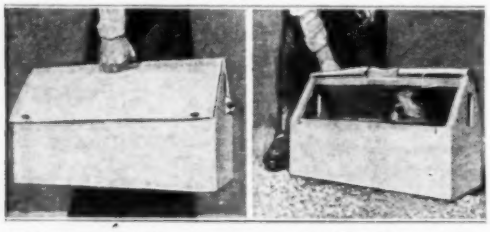
Holder for Cuspidor in Sick Room

A very important part of the sick-room equipment is a cuspidor. This, as a rule, is merely placed on the floor at the side of the bed, where it is easily upset, and where it is often impossible for the patient to reach it. The clamp shown in the drawing holds the cuspidor on the bedpost within easy reach of the patient, and where it is not easily overturned. The clamp is made from narrow strap iron or other metal, and is held to the bedpost by a small bolt, which allows quick adjustment to any height desired. The cuspidor can be slipped in or out of the spring ring very quickly.—John G. Pope, Worcester, Mass.



A Pet-Animal Carrier

Almost every owner of a pet dog or cat has occasion to carry it from place to place at one time or another. Unless



A Carrier Enables the Owner of a Pet Cat or Dog to Take the Animal with Him on the Train or Street Car

these owners have at their disposal a conveyance with which they can carry their pets to the distant point, they are dependent on the railway or street cars for transportation, if the destination is beyond walking distance. Animals cannot be taken on the railroads unless they are carried in covered baskets, and those that are too large to be carried must be checked in the baggage car. On the city railways, animals that cannot be carried will not be transported.

The two photographs show a carrier which can be made very easily, and at little expense. It is very light, but serviceable and strong. The covering is made of strong canvas, heavy oilcloth, or similar material. The bottom of the carrier is made of a solid piece of wood. The sides and ends are also solid, but should be of very thin wood so as to keep the carrier as light as possible. Ventilating holes should be cut in the ends. The pieces for strengthening the slanting edges are cut from ½ by ¾-in. strips. The slanting pieces, or rafters, are nailed to the corner pieces and ends. The ridge pole is made 1¼ in. wide, and just long enough to fit in between the ends. One or two strong nails should be driven through the end walls into the ridge pole, thus making a very strong frame. The uprights should be rounded off so that the animal will not be injured if it should happen to strike them with any force. The edges of the ridge pole should also be slightly rounded for good appearance. A space about 4 in. long should be rounded nicely at the center of the ridge pole, as this part is to serve as a handle.

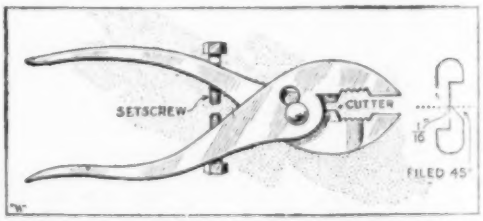
When tacking on the canvas, care should be taken to stretch it just as much in one direction as in another, in order to get it even. The canvas is tacked on all around the ends, as shown in the photograph. When it is stretched, a diagonal cut can be made across the openings in the ends, and the canvas folded over on the inside and glued. For the cover, sides, and bottom, one piece is used. The edges are folded in so that the width of the piece will just equal the length of the sides of the carrier. The edges of the cover are turned back and glued. Extra pieces of canvas should be glued on where the slits for the two screw eyes come; these screw eyes serve as simple but very efficient buttons or catches. A hole, 4 by 5 in., is cut into the canvas as shown, so that the handle can be grasped.—Frank W. Harth, New York, N. Y.

Removing Dents from Wood

Wood fillers, or putty, used to remove dents and bring the wood up to its original level, will make an unsightly bump if the wood afterward rises. The dents may be removed, even after the wood has been stained, by pouring boiling water directly on the dent for a period of five minutes, or whatever time is necessary to do the work. Unless the dent is very deep, or the fibers have been torn, the hot water will raise the sunken part almost to its original level. In the case of smaller dents, the result will be a repair which can hardly be noticed.—Charlie W. Dyer, Stratton, Me.

Pliers Converted into Saw Set

A pair of ordinary automobile pliers, which can be purchased for a few cents, is readily converted into a handy saw set. To make this conversion, file or grind off the corners of the wire-cutting part of the jaws to about the shape indicated in the sketch; then tap two setscrews into the handle, as shown, to form an adjustable stop. The two jaws are then brought against adjacent teeth of the saw which



A Change Readily Made in a Pair of Automobile Pliers Forms a Handy Saw Set

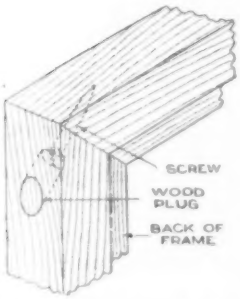
is to be set, thus taking the place of an expensive tool for this purpose.—Richard Schmitz, Birmingham, Ala.

Electric Fan Dispels Odors in the Kitchen

Preparing onions or horseradish is among the most disagreeable tasks of the housewife, due to the fact that these vegetables cause the eyes to smart and fill the workroom with disagreeable odors. By directing the air current from the electric fan in such a way that the odor is driven away from the work and toward an open door or window, much of the unpleasantness can be removed. The same method will be of aid in removing a musty or unpleasant odor from any room.—S. Zemon, Baltimore, Md.

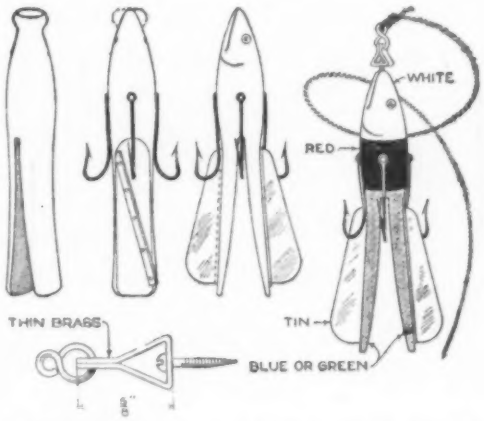
A Strong Picture-Frame Joint

The average amateur has a good deal of trouble to get the joints of a picture frame secured satisfactorily. A very strong joint can be made by boring a ½-in. hole in the side of the frame to a depth of about ½ in., and then, by working from this, boring a small hole at right angles to the miter and inserting a screw. The ½-in. hole is then plugged up with wood, taking care to have the grain of the plug run in the same direction as the grain in the frame. Glue the plug in and level off the wood afterward. By using this method, the joint is held so firmly that the finishing can be commenced immediately after the frame is put together.—Chas. Illingworth, Mission City, B. C., Can.



Effective Spinner Bait Made from a Clothespin

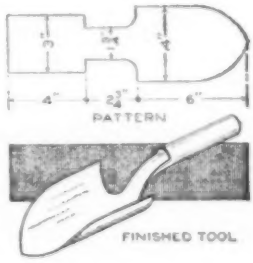
The popular spinner bait, which is rather expensive, can be made quite easily at home from an ordinary wooden clothespin. For the body of the bait, cut the head of the clothespin to roughly resemble that of a minnow. The outside of the clothespin legs should be cut flat. In order to secure the spinning, or whirling, motion, two metal wings, 2 in. long and ⅜ in. wide, are tacked to the fins of the clothespin. These are fastened at angles to the edges of the pin, that on one side being set at the opposite angle to the one on the other side. This setting of the wings causes the bait to spin when drawn through the water. In order to allow the bait to spin without twisting the line, a swivel connection is made between the fishline and the head of the bait. This is made from a piece of very thin metal, ¼ in. wide, bent as shown in the drawing. The hole for the nail which holds it to the bait is made large enough so that the bait turns freely. A piece of wire forms the ring to which the fishline is attached. Four hooks are fastened in the middle of the clothespin body and extend parallel with the body. The completed bait may be painted as desired, the usual method being to paint the head white, the body red, and the tail either blue or green.—P. P. Avery, Garfield, N. J.



A Clothespin is Used for the Body of an Artificial Bait That Spins as It is Drawn through the Water

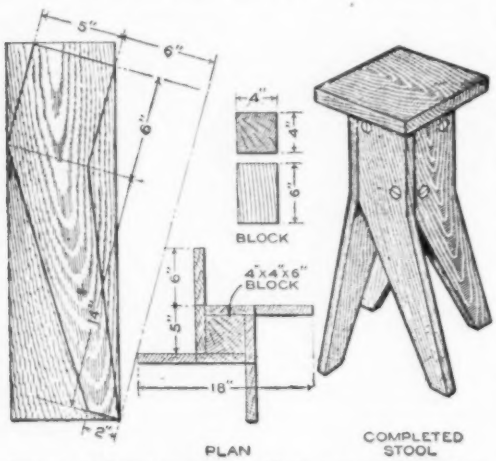
A One-Piece Garden Trowel

Some sort of serviceable garden trowel is needed by every person who tends to a flower bed or small vegetable patch. A very good trowel can be made from heavy-gauge sheet steel. First cut the steel to the shape and dimensions shown in the sketch. Then bend it as indicated, sharpen the edges with a file, and the trowel is complete. The handle may be made more comfortable to work with, if so desired, by wrapping it with adhesive tape.—C. A. Traxler, McKees Rocks, Pa.



A Queer Wooden Stool

This stool is much stronger and more serviceable than appears at first glance. It can be built from scrap ends of lumber.



Scraps of Lumber can be Made into a Somewhat Odd-Looking but Durable Stool

Cut out four legs from 7/8-in. stock, being careful that the grain of the wood runs as shown in the drawing. The rectangular end of these legs should then be screwed to a 4 by 4-in. block; when all four legs are attached to the square post, the bottoms of the legs will spread about 18 in. A suitable seat is then secured to the top of the post. If desired, the post can be drilled and threaded to take a seat similar to a piano-stool top, which can then be adjusted to the proper height for the person using it.

Old Magazines Used for Shingles

Needing some shingles for a kennel, a dog fancier conceived the idea of using old magazines in place of the high-priced wood or patent shingles. After two years of service, the shingles show that paper packed flat, as it is in a well-made magazine, will stand the weather for a long time.

The magazines used were those printed on the best grade of paper, 9 by 12 in. in size. Most of these magazines are about 1/4 in. thick, and a few pages can be torn from the back when necessary. Magazines of the size of Popular Mechanics were also used, but, in this case, each magazine was cut into two equal parts so that each copy made two shingles.

Paper is a wonderful nonconductor of heat, and using these magazines for shingles secured protection against cold for the dog kennel, and also was a sufficient protection against storm. Only 2 in. of the magazine shingles were laid to the weather, and the lower edge of each shingle was formed by the binding of the magazine. Ordinary shingle nails were used to secure the magazines in place. Both the roof and walls of the kennel were protected in this way. The result was a dog kennel that was very warm; absolutely no wind could get through it, and the roof kept out water in fine shape. For the roof, the best magazines were used, that is, those with a heavy cover of well-calendered, hard paper. The cover was placed upward.

There is no reason why many other buildings could not be made warm and dry by the use of magazines for shingles. Especially the side walls can be covered with this kind of shingle, which will remain in service nearly as long as those of wood. The dog kennel, when completed, was given a liberal coat of heavy paint. The paint stiffened the paper just enough so that each shingle was held in place, and was protected from the rain. From a short distance these magazine shingles could not be told from any other painted shingle. It would be an easy matter to go into one's garret and gather enough old magazines to shingle a small garage, stable, shed, or other outbuildings.

Wrench Made of Sheet Iron

A wrench, which will be satisfactory for light work on small nuts, can be made from a strip of sheet iron and a piece of hard wood. The dimensions depend on the size of the nut the wrench is to be used on, but the iron should be of rather heavy gauge, and at least 3/4 in. wide. It is bent around the nut, and the ends are fastened to the hardwood handle with screws or bolts. While this wrench will not do for heavy work, it will be found useful where a great many small nuts of one size are to be tightened.—Elwood L. Glassford, New York, N. Y.

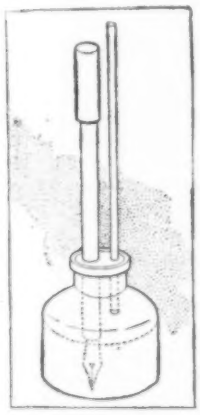
¶ For cutting light armored cable, a three-cornered file is preferable to a hacksaw.

Photographing Cracked Negatives

A cracked glass negative can often be copied, so that the crack does not show, by running a little glycerin along the glass until the glycerin fills the crack. A sheet of glass is laid on the surface of the negative, also with a little glycerin, to cause it to unite optically, and the negative can then be photographed, with the crack almost, if not quite, invisible.—H. J. Engel, New Braunfels, Tex.

Filling Fountain Pen by Suction

One way to fill a fountain pen not provided with a self-filling mechanism, without soiling the fingers, is to fit into the ink-bottle cork a small glass tube, as shown, and make another hole in it large enough for the pen barrel to fit in it tightly. Insert the pen, and adjust it until the lower end of the barrel is completely submerged in the ink. Now take the end of the glass tube between the lips, and draw in a long breath, so as to withdraw as much as possible of the air which is in the ink bottle. This will cause the air inside the fountain pen to flow out and bubble up through the ink, until the air inside the pen is reduced to the same pressure as that in the bottle. When the lips are removed from the glass tube, and the air rushes back into the bottle, its pressure forces the ink up into the pen, which is then withdrawn ready for use. While the exhaustion of air from the bottle by this method can by no means be complete, it was found by test that practically the same amount of ink was drawn up into the pen by this method of filling as would be dropped into it by using the ordinary fountain-pen filler.—J. Garrett Kemp, Stillwater, Okla.

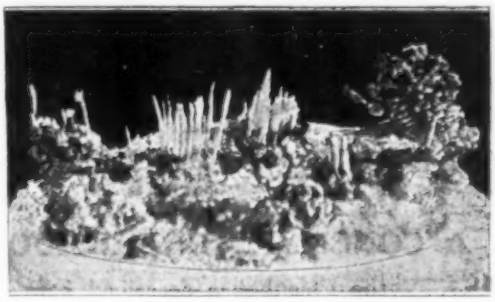


Necktie Pressed without an Iron

A badly wrinkled necktie may be made to present a much better appearance by wetting it slightly and then drawing it slowly around a section of a hot steam or vapor radiator, which has been thoroughly cleaned beforehand.

Silicates Form Chemical "Plants"

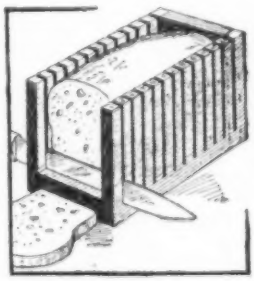
To make a "chemical garden," put 2 or 3 in. of sand into a glass fish globe, or some similar vessel. Then arrange, on the sand, some pieces of the sulphates of copper, aluminum, and iron. Pour over this a solution of one part of sodium silicate (water glass) to three parts of water. Let the globe remain quiet for about a week, after which a dense growth of the various silicates of the minerals will have taken place, in beautiful and varied colors. Finally the silicate solution may be replaced with clear water, to enhance the effect. This is done by passing a stream of water through a rubber tube into the globe until all cloudiness has vanished from the liquid inside it.

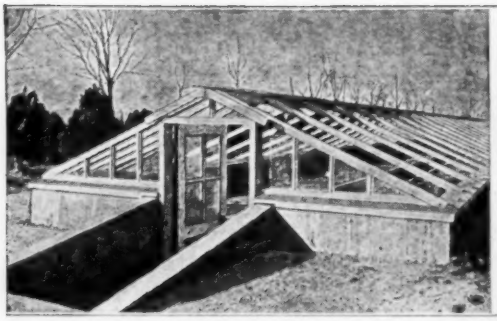


Silicates Deposited from a Solution Form Beautiful Flowerlike Shapes on the Glass Walls of the Vessel

Gauge for Slicing Bread

Cutting bread in slices of uniform thickness can be easily accomplished by using the bread gauge shown in the sketch. The gauge is a trough large enough to hold the average loaf of bread snugly. Its sides, which should be of fine-grained hard wood, 1 in. thick, are nailed to the bottom piece, which is 2 in. thick. Slots are cut in the sidepieces every 3/8 or 1/2 in., or closer if desired. The trough may or may not have end pieces. The gauge will be even more handy if the wood between the slots is numbered, as shown in the sketch, to enable the housewife to tell just how many slices she is cutting.—C. S. Cierpik, Urbana, Ill.



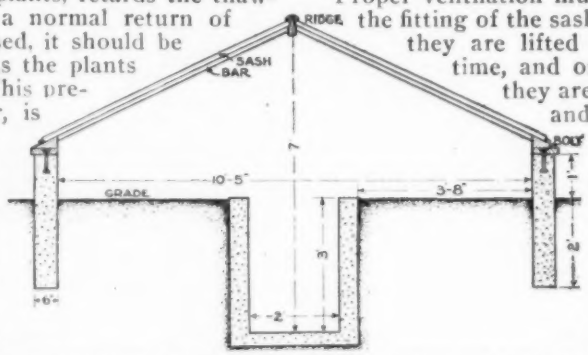


At the Left Is the Greenhouse Completed Except for the Sash, the Form of Concrete Stairway and the Entrance being Made Clear. The Right-Hand View, besides Giving an Idea of the Bench and Side-Wall Construction, Indicates the Growth of a Crop of Lettuce by the 20th of March, at Which Date the Picture was Taken

A CONCRETE GREENHOUSE THAT USES NO FUEL

SINCE the greenhouse described here has the virtue of requiring no fuel, it is really a combination of greenhouse, hotbed, and cold frame. While the plants in it will freeze in zero weather, the natural process of thawing leaves them unharmed. A thin layer of straw, or similar material, on the glass, to keep the sun from the frozen plants, retards the thawing and assures a normal return of circulation. If used, it should be left on as long as the plants remain frozen. This precaution, however, is seldom necessary. Snow makes the best of winter coverings, and should not be removed except by nature's hand.

The foundation and walls of the greenhouse are of concrete. The upper structure may be of cypress or redwood. The outside width is 11 ft. 6 in., the length depending upon the number of sashes required for a particular purpose or location. Hotbed sash, of the standard 3 by 6-ft. dimensions, is used. Fitting into the ridge pole, at the upper end, they rest at the lower end on the timber heading of the concrete side walls, and are readily removable. The height from the ground to the ridge is 4 ft. The center walk is 2 ft. wide and 3 ft. below ground level, reached by cement steps. This makes the clearance from walk to ridge 7 ft. Concrete side walls, 3 ft. high and 4 in. thick, join the walk at the bottom and confine the benches at the top. The outside walls are 6 in. thick and 3 ft. high, with one foot above ground and two beneath. The benches are the same level as the outside ground.



Cross Section of Greenhouse, Giving Dimensions and Locations of Walls, Benches, Sash, and Finished Structure: Bolts for Fastening Headers to Outside Walls are Shown in Place

Proper ventilation must be provided in the fitting of the sashes. In the spring they are lifted out, a few at a time, and ordinarily by May they are entirely removed and replaced by cheesecloth, which provides shade for the plants, and bars out insects. Gradual removal of the sash hardens the plants to the outside weather. Being adapted to crops of many kinds, the greenhouse may be kept occupied all year. Radishes, beets, and lettuce in March or April; blooming plants and summer vegetables, such as tomatoes and cucumbers, in May; leaf and head lettuce in August, and in November, cabbage and cauliflower, for spring transplanting, offer opportunities to secure several crops a season.

As the length is left indeterminate, the cost of such a structure must be calculated by the running foot. It should average about $6, but would, of course, be largely influenced by local labor charges.

IN accordance with the editorial policy of this magazine never to accept compensation in any form for what appears in our reading pages, and also to avoid all appearance of doing so, we are obliged to omit the name of the maker or the seller of any article described. This information, however, is kept on file and will be furnished free, by addressing Bureau of Information, Popular Mechanics Magazine, Chicago. [Editor.]

Caruso as Canio

Gluck as Nedda

Music that is more than a memory

The Victrola makes the opera and the concert more than a fleeting pleasure. It brings them right into your own home, there to be enjoyed as your permanent, priceless possession.

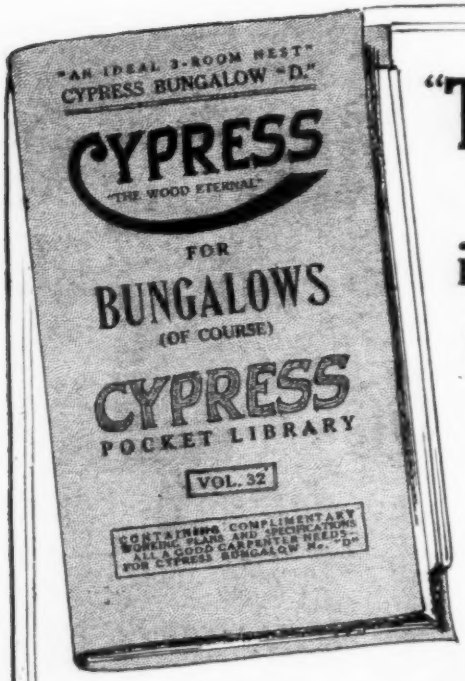
You can have encores without number. You can hear the interpretations by the very same artists who won your admiration at the opera or concert—for the world's greatest artists make records for the Victrola.

Victors and Victrolas $12 to $950. There are Victor dealers everywhere, and they will gladly play any music you wish to hear and demonstrate the Victrola. Saenger Voice Culture Records are invaluable to vocal students—ask to hear them.

Victor Talking Machine Co., Camden, N. J., U. S. A.

Important Notice. Victor Records and Victor Machines are scientifically coordinated and synchronized in the processes of manufacture, and their use, one with the other, is absolutely essential to a perfect reproduction.

New Victor Records demonstrated at all dealers on the 1st of each month



"The Littlest Home"

(and the sweetest little nest ever)

is Cypress Bungalow "D"

for which **FREE PLANS** and complete **Working Drawings and Specifications**

can be had immediately by writing for

Vol. 32 OF THE **Cypress Pocket Library**

3 Sunny Rooms for 2 Happy People { *SO FAR*

(a joy and a permanent blessing to any one with even a little piece of ground to put it on.)

Full Working Plans and Specifications Free

if you simply write us for a copy of **Vol. 32**

of the Cypress Pocket Library—that "guide, counselor and friend of the home-lover"—who also is a good enough economist to insure himself against the Ravages of Repair Bills by building of Cypress, "the Wood Eternal," *at first.*

AND THEN—THOSE DELIGHTFUL VOLUMES (WITH FREE PLANS) ON PERGOLAS, SUN-PARLORS, SLEEPING PORCHES, LITTLE GREENHOUSES, ETC.

Better write at once for **Vol. 32**—and also ask for **Vol. 1,** which contains full list of over 40 free volumes of this "Lumber Classic."

Remember—We recommend Cypress Lumber only for uses in which it is best for YOU.

Let our "ALL-ROUND HELPS DEPARTMENT" help YOU. Our entire resources are at your service free

SOUTHERN CYPRESS MANUFACTURERS' ASSN.

1219 HIBERNIA BANK BLDG., NEW ORLEANS, LA., or 1219 HEARD NAT'L BANK BLDG., JACKSONVILLE, FLA

INSIST on **TRADE-MARKED** CYPRESS of YOUR LUMBER DEALER. IF HE HASN'T IT, *Let Us Know*

Popular Mechanics Magazine

6 N. Michigan Avenue, Chicago, U. S. A.

EDITED BY H. H. WINDSOR

London: Hachette & Cie, 18 King William Street, Charing Cross, W. C. 2 | Paris: Hachette & Cie, 111 Rue Reaumur | Melbourne, Australia: The Australasian News Co.

ISSUED MONTHLY | SUBSCRIPTION: | SINGLE COPY, 20 CENTS

In United States, and its possessions, American Expeditionary Force, Cuba, Mexico, and Canada, per year, postpaid - - - - - - - - - - - - $2.00

To all other countries in the Postal Union - - - - - - - - - - - 2.50

All subscriptions are discontinued at expiration. Please examine the date printed on your wrapper.

Entered as Second Class Matter Sept. 15, 1903, at the Post Office at Chicago, Illinois, under Act of March 3rd, 1879. Entered as Second Class Matter at the Post Office Department, Canada.

Published monthly by POPULAR MECHANICS CO.

Copyright, 1919, by H. H. Windsor.

Vol. 31 | No. 6

Contents for June, 1919

Accident—Airplane and Locomotive in Collision 814
Accident—Freight Car Lands on Top of Gondola 808
Accident—Girl Falls from High Tower..... 802
Accident—Girl Revives after Ten Hours in Water 918
Accident—Glaring Headlight Causes Auto Wreck 842
Accident—Pipe Line Stops Fall of Truck..... 852
Accident—Warehouse Collapse 872
Accident—Wood Car and Steel Car in Collision.. 852
Aeroplane Carries Doctor to "Flu" Patients..... 874
Aeroplane, Flying Boat Made from..... 875
Aeroplane, High Altitude, Flying West, Carried East, by Major R. W. Schroeder..... 809
Aeroplane, Ignition Circuit Breaker for..... 897
Aeroplane Line to St. Moritz, Switzerland..... 887
Aeroplane Model Employs Unusual Principle.... 889
Aeroplane, Pilotless, Is Flying Destroyer..... 841
Agriculture—Science Vindicates Farmer's "Signs" 894
Air Sounding Apparatus on British Ship..... 862
Ambulance, Aerial, Carries Hospital Equipment.. 900
Anesthetic, Nikalgin, Invented by American..... 804
Animals, Wild, Census of, by W. F. Wilcox..... 895
Arrow Indicator on Submarine Chasers..... 826
Artillery—Substitute Fitch for Gun Carriage..... 816
Automobile—Pulley Clamped to Has Many Uses 892
Automobile Safety Signal Warns When Brakes are Applied 873
Automobile Salesman, Field Glass Aids..... 916
Automobile Top, Closed and Open Combined.... 853
Automobiles, Stolen, Secret Markings Recover.. 802
Automobiles, Title or Deed to Prevent Theft of.. 806
Aviation—Aerial Police Force for New York.... 854
Aviation—Atlantic City Air Port First in World. 812
Aviation—Device Gives Fliers Aerial Sensations 833
Aviation—Pioneer Flights over Ocean and Land 818
Aviation—Some Peculiar Landings of Airmen.... 815
Aviation—The First Flight, by Searle Hendee... 882
Aviation—Women's Flying Costumes..... 862
Balloon, Airman Dives from..... 816
Balloon Observers to Watch for Forest Fires.... 826
Balloon Observers Trained on Mountain Peak... 867
Balloon Parachute, New, Saves Basket..... 909
Balloonist, Roof Guards from Falling into Pit.. 863
Balloons, Gas, Explode to Release Propaganda.. 906
Balloons, Water Valve Prevents Overinflation... 874
Balloons, Portable Gas Plants for..... 881
Band, Brass, Indians Use at Tribal Festivals.....854
Barley, Experimenters Feed to Milch Cows..... 906
Bathing Pool, Beautiful, at Small Expense..... 896
Bridge Span Hauled by Motor Truck..... 865
Building—Miners Build Homes under Cliffs..... 879
Building Constructed for National Tractor Show 865
Building—Studio Built from Driftwood..... 863
Buildings, Fireproof, Have Steel Shelves..... 813
Buildings Quickly Erected with Wooden Netting. 869
Buzzer Signal Set Uses Transformer..... 816
Camera, Make Many Pictures on One Film with 817
Camera, Scale Helps to Focus..... 866
Canal, Panama, by E. T. Bronsdon..... 855
Car, Racing, Sandbags Fail to Stop..... 861
Cathedral, St. Paul's, Partially Restored..... 912
Cathedral, Services Held in Completed Part.... 855
Chains, Tire, Springs on Prevent Flapping..... 893
Children's Page 920
City, Americanization Campaign for, by Paul Jenkins 913
Clay, Tamping, Brick Machine Shapes..... 913
Clinkers, Water Jet Removes..... 848
Clothing Principles Taught in Government Course 863
Clown, Face of, Entrance to Show..... 860
Coast Defense, Camouflaged Mortars for..... 916
College of Fisheries at State University, Seattle 898
Concrete Piling, Compressed Air Method for... 906
Corn, Frost Proof, by Robert H. Moulton..... 907
Corn, Seed, Electric Tester for.....843
Coyote Nuisance, Poison Pellet Lessening..... 880
Crutch has Spring Shock Absorber..... 908
Dam, Automatic Tilting, Regulates Flood Water 864
Dirigibles, British, "R 33" and "R 34"..... 822
Doll, Walking 838
Dye, European, America Now Independent of... 864
Education—University Drops Latin Requirement 842
Electricity—Controller Contacts Saved by Interrupting Current 916
Electricity—Pocket Device Tells Kind of Current 807
Elevator, Concrete Grain, Sinks 13 Inches..... 824
Elevator, Light Warns When Overcrowded..... 918
Fair, Lyons, Attracts American Displays..... 900
Ferry, English Channel, Would Carry 300 Cars.. 846
Fire, Honolulu, Smoke Rises Mile from..... 866
Fire Truck Has Rescue Cage..... 803
Flag, New, Canada's Merchant Fleet Has..... 902
Flag, for Ships Accompanying Submarines..... 840
Fleet, Atlantic, Makes Speed Test..... 838
Forest Conservation, Traveling Exhibit Teaches 881
Forest, National, Public Recreation Grounds in.. 909
Fuel, Liquid, Coal Dust Mixed with Oil Makes.. 878
Fuel, New, Made of Coke Dust..... 918
Furnace, Fire Box Wall Helps Burn Soft Coal.. 876
Garage Has Four Floors Opening on Street... 878
Gas Production, Downflow of Steam Quickens.. 897
Generating Plant on Top Deck of Ship..... 804
Glassware, Suction Holds on Etching Machine.. 854
Goats Graze Fire Break to Reduce Forest Fires 922
Grand Cañon, Improved Gateway for..... 917
Greenhouse, Concrete, Uses No Fuel..... 960
Gun, Lewis Machine, Loading Device for..... 805
Hands, Plastic Artificial, Quickly Shaped for Use 878
Hay, Truck Method of Curing Saves Losses.... 904
Heating Plant, Hot Water, for Cellarless Houses 901
Highway, Lincoln, Recent Gift will Finish..... 861

[Continued on Page 4]

Popular Mechanics offers no premiums; does not join in "clubbing offers," and employs no solicitors to secure subscriptions. It is for sale by nearly every newsdealer in the United States and Canada.

[Contents—Continued]

Horseshoe, Nonskid, Made for Pitchers..... 874
Houses, London, England's Rich Discard..... 919
Influenza Epidemic, Audience Sprayed During... 850
Influenza, Strips of Oilcloth Check Spread of.... 889
Insomnia, Device Cures by Supplying Dry Air.. 824
Iodine, Surgeon Uses Many Times..... 843
Iron, Galvanized, New Process Improves..... 873
Journey—Couple Will Walk Around World.... 901
Kiln, Lumber, Air Automatically Adjusted in.... 905
Lake, Gushing Well Makes on Farm..... 893
Lake, Leaky Bottom Covered with Clay..... 860
Lead Electrically Hardened Is Bearing Metal.. 902
Lightning, Photograph of, at Close Range..... 880
Locksmith Crosses Continent in Auto..... 876
Lumber, American, Foreign Markets Eager for.. 876
Lumber Yard, Old Timber Wall Keeps Fire from 864
Mail Route, Aerial, from Vancouver to Seattle.. 804
Mantelpiece, Cement, Resembles Wood..... 922
Medal, Victory, for Soldiers of Allied Armies... 860
Memorial, Roosevelt's Birthplace Bought As.... 868
Merry-Go-Round, German, Americans Capture.. 880
Metal Spraying, Use Electric Arc for..... 862
Mine Sweepers, Dutch, Scour North Sea..... 869
Mines, Stray, Many Still in Ocean..... 896
Monument to Soldiers, Texas Ranchmen Erect.. 837
Mosquitoes, Collection of in National Museum... 898
Motor, Liberty, Development of..... 898
Motorcycle, Handle Brazed to Frame of..... 843
Motorcyclists to Survey London-Sydney Air Route 823
Motorcycle Used as Tractor for Plowing..... 902
Motorcycles Used in Testing Army Balloons.... 849
Moving Picture Screen Soaked to Make Translucent 862
Mower for Golf Grounds Has Corrugated Blades 893
Muffler of Helical Shape Reduces Back Pressure 908
Navy Recruits Get Outfits When Found Mentally Fit 894
Novelties for the Home..... 914
Nut, Cotter Pin Locks..... 894
Packages, Better, How the War Brought Them Out, by E. T. Bronsdon..... 825
Padlock, Combination, Used in Navy..... 908
Parachute and Airman, Explosion to Expel..... 919
Parade, New York's, for 27th Division..... 890
Phonograph Built to Resemble Log Cabin..... 908
Picture, Panoramic, of Battle Front..... 870
Pigeons Aid in Patrol of National Forests..... 832
Pipe, Discharge, Floated on Wood Pontoons.... 835
Pipe, Iron, Cast in Centrifugal Mold..... 851
Pipe Line, Wood Stave, Has Unusual Test..... 808
Planer, Ship, Side Cutting..... 861
Planter, Automatic, Attaches to Cultivator..... 834
Platinum, American Buyer Brings from Russia.. 837
Plow, Garden, with Hinged Shovels..... 842
Police Force, Aerial, in California..... 847
Pool, Use Gun instead of Cue to Play..... 876
Press, Electric, for Making "Seggars"..... 888
Press, Filter, for Practical Tests..... 918
Prize for Walnut Branding Machine..... 866
Programs, Used Theater, Cleaned and Pressed.. 852
Pump, Turbine Driven, for Boiler Feed Work... 906
Pushcart in Cupola Building..... 851
Radiator Cap, Small De Haviland Plane Is..... 837
Radiator Cover, Adjustable..... 918
Radio Compass Stations, Navy Builds..... 834
Radio, Ireland-American 840
Radiotelephone Station, Portable..... 807
Railroads to be Reorganized in Chile..... 902
Railway, Projected, for Northern Canada..... 919
Reconstruction Work, Army, to be Recorded .. 823
Republics Exceed Monarchies in Number..... 875
Restaurant, Motorized, for New York Police.... 813
Rifle Scores, High, Made with New Sights..... 902
Rubber from Rabbit Brush, by J. Cecil Alter... 848
Rubber Scarcity, German Trucks Show..... 906
Sailors, Shipwrecked, Crude Still Saves Lives of. 872
Salt Storm Maroons Workmen..... 835
Sand Blast Operator, Steel Room for..... 839
Saw, Circular Hand, Electrically Operated..... 838
Saw Handle, Hinge in Saves Knuckles..... 847
Saw on Rollers Cuts at All Angles..... 886
Scaffold, Portable, Made of Ladders..... 869
School, Chinese, at Victoria, B. C..... 888
School, Traveling, for Negroes..... 887
Scrapbook, War, Weighs 100 Pounds..... 864
Screw Thread Accuracy, Project Pictures to Test 823
Ship, "Deucalion," Five Years' Overdue..... 876
Ship—Dreadnaught, "Idaho," Recently Completed 801
Ship, Miniature, Given to President Wilson..... 840
Ships, Seaplane, Differ in Construction..... 846
Shuttle, Elastic, Prevents Breakage..... 850
Sign Gives Street Car Routes to Hotels..... 879
Sign Warns Motorists to Watch for Planes..... 868
Signs Warn Public against Polluted Water..... 812
Sled, Motor, for Rural Mail Carrier..... 922
Sleigh, Motor, Across the Cascades in..... 830
Soldiers, Mutilated, Hand Painted Copper Faces for, by Grace Goulder..... 844
Soldiers, Wounded, Through Train for..... 919
Soldiers, Crippled, Machine Tests Incapacity of 860
Soldiers Form "Amputation Club"..... 816
Sound Magnifier, Airman Aloft Uses in Making Speech 829
Speedway on Roof Top is Tire Tester..... 873
Square, Folding, for Carpenter..... 843
Stadium, "Pershing" to be Given to French.... 888
Stairway Built to Base of Shoshone Falls..... 867
Statue, Bronze, Memorial to Texas Ranchman.. 806
Steel, New, Tools Cast from Need Little Machining 863
Steps, Nonslipping Tread for..... 916
Street Flusher Has Speaking Tube..... 877
Subway, New York, Special Cars for..... 837
Surgery—Lessons Taught by War..... 842
Tank Tries Trip up Pikes Peak..... 839
Tank, Two Engine, Steers by Shifting Gears.... 912
Tanks, Large Oil, Floated to New Position... 853
Tanks, Water Softening, Made of Concrete..... 878
Tea Ball Made Like Submarine..... 874
Telephone, Trench, Has Telegraph Button..... 874
Time, Uniform for United States..... 886
Tractor and Separator Shipment Breaks Records 849
Tractor, Electric, Used in Hospital..... 893
Tractor, Farm, with Endless Treads of Steel.... 840
Train, Two Locomotive, Has Single Control... 879
Tree, Apple, Cage and Burglar Alarm Protect... 894
Trees, Dwarf, Japanese Grow..... 835
Trees, Large Shipment for Reforestation..... 838
Trolley Car, Trackless, Use in New England.... 834
Truck, Enameled Tank, Carries Soft Drinks.... 868
Truck Line, Motor, Operated by Farmers..... 850
Tumblers, Machine Rounds Edges of..... 892
Tunnel for English Channel..... 837
Tunnel, Simplon, Changes System of Ventilation 896
Turbine, Water, Double Action..... 917
Wall, Well Designed Retaining, for Playground.. 901
Walls, Concrete, with Dead Air Chamber..... 880
War Material, Salvage of Enormous Task..... 903
War Stories, Tangled, Confuse Public..... 832
Water Heater, Electric, Can be Packed in Traveling Bag 824
Wheat Wasted by Threshing Machines, Saving. 899
Wheel, Motor Truck, Spring Floated..... 889
Whistles of Different Tones for Referee..... 908
Winch, Steam, Makes Work Easy for Stevedores 808
Wireless, Cured of Static Troubles..... 892
Wood, Buy by Weight for Fuel..... 807
Wrench, Monkey, Works at Several Angles..... 881
X-Rays Test Concrete Ships, Defects..... 898
Yellow Fever, Fight against to be Renewed..... 872

SHOP NOTES

Anode, Double, for Electroplating..... 925
Automobile, Air Propelled, Building..... 927
Automobile Bearing Races Tightened by Solder. 942
Automobile Camping Outfit..... 923
Automobile, Driving with Sheared Hub Key.... 936
Automobile Hood, Waterproof, Protects Coils.. 924
Automobiles, Used, Frauds Practiced in Selling.. 932
Bench, Portable, for Plumbers..... 942
Bottles, Crown Top, Opener for..... 933
Broom, Attachment Fastens Cloth on..... 941
Bushings, Tight, Driving Out by Fluid Pressure 934
Chuck Jobs, Centering Quickly in Lathe..... 932
Clamp, Rope, Quick Acting..... 938
Clamp, Saw Sharpening, Wooden Block Forms.. 937
Clothespin, Spring, Converted into Testing Clip.. 937
Cord Adjuster, Simple..... 935
Cork, How to Drill Holes through..... 924
Door, Sagging, Remedying..... 942
Drill, Centerboring, for Brake Lining..... 936
Engines, Auto, "Running In" after Overhauling. 926
Fan, Ceiling, Made of Pipe Fittings..... 941
Flagpole Pulley Lubrication..... 936
Fly Catcher, Vacuum..... 939

[Contents Continued on Page 6]

DRAKE'S PRACTICAL HOME STUDY BOOKS

Will Raise Your Pay

Cash in on the opportunities offered by this reconstruction period. After-the-war work has created a greater demand for trained men than ever before — greater opportunities — bigger pay — more rapid advancement. It's training that counts now — accurate knowledge — a complete grasp of your trade. You'll find a short-cut to the fat pay-envelope if you will study Drake's Practical Books.

Order direct from this page!

Electrical Books

Alternating Current—Theory, Practice and Diagrams .....Cloth **$1** .....Leatherette **$1.50**
Wiring Diagrams and Description ....Cloth **$1** .....Leatherette **$1.50**
Armature and Magnet Winding .....Cloth **$1** .....Leatherette **$1.50**
Modern Electrical Construction .....Cloth **$1** .....Leatherette **$1.50**
Electricians' Operating and Testing Manual .....Cloth **$1** .....Leatherette **$1.50**
Drake's Electrical Dictionary .....Cloth **$1** .....Leatherette **$1.50**
Electric Motors, Direct and Alternating .....Cloth **$1** .....Leatherette **$1.50**
Drake's Telephone Handbook .....Cloth **$1** .....Leatherette **$1.50**
Easy Electrical Experiments and How to Make Them.....Cloth **$1**
Operators' Wireless Telegraph and Telephone Handbook.....Cloth **$1**
Telegraphy Self-Taught.....Cloth **$1**

Shop Practice Books

Sheet Metal Workers' Manual, Leatherette **$2**
Sheet Metal Work and Pattern Drafting .....Cloth **$1.50**
Oxy-Acetylene Welding and Cutting ....Cloth **$1** .....Leatherette **$1.50**
Modern Blacksmithing.....Cloth **$1**
Machine Shop Practice.....Cloth **$2**
Practical Mechanical Drawing.....Cloth **$2**
Pattern Making.....Leatherette **$1.50**

Steam Engineering

Swingle's Handbook for Steam Engineers and Electricians.....Leatherette **$3**
Complete Examination Questions and Answers for Marine and Stationary Engineers.....Leatherette **$2**
Steam Boilers, Their Construction—Questions and Answers...Leatherette **$2**

Railway Books

Locomotive Engineering.....Leatherette **$3**
Locomotive Engine Breakdowns, with Questions and Answers...Leatherette **$2**
First, Second and Third Standard Examination, Questions and Answers for Locomotive Firemen.....Leatherette **$2**
Complete Airbrake Examination Questions and Answers.....Leatherette **$2**

Painting Books

Scene Painting and Bulletin Art...Cloth **$3**
A Show at Sho' Cards.....Cloth **$3**
Sign Painting.....Cloth **$3**
Strong's Book of Designs.....Leatherette **$3**
Modern Painter's Cyclopedia...Cloth **$1.50**
Automobile Painting.....Cloth **$1.25**
Estimates, Costs and Profits, House Painting and Interior Decorating.....Cloth **$1**
New Hardwood Finishing.....Cloth **$1**
New Stencils and Their Use....Cloth **$1.25**

Carpentry and Building Books

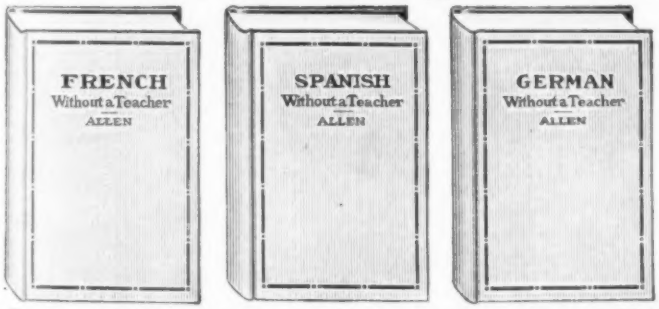
Modern Carpentry, 2 vols.....Cloth **$2**
The Steel Square, 2 vols.....Cloth **$2**
Wooden Boat and Shipbuilding, Cloth **$1.50**
Modern Estimator.....Cloth **$1.50**
Light and Heavy Timber Framing..Cloth **$2**
Builders' Architectural Drawing...Cloth **$2**
Concretes, Cements.....Cloth **$1.50**

General Instruction and Reference Books

Practical Up-to-date Plumbing, Cloth **$1.50**
Hot Water Heating .....Cloth **$1.50**
Practical Handbook for Millwrights, Cloth **$2**
Elementary Chemistry, Self-Taught, Cloth **$1**
Complete Courses in Civil Service.Cloth **$1.50**
Standard Cyclopedia of Recipes, Cloth **$1.25**
American Star Speaker.....Cloth **$1.25**

Modern Language Courses

FRENCH Without a Teacher
SPANISH Without a Teacher
GERMAN Without a Teacher



Just out! By Professor Phillip Schuyler Allen, University of Chicago. An entirely new home-study series of modern foreign languages. Simplest, easiest-to-master language method ever devised. With the foreign markets of the world open to the United States it will be a great advantage to you to master these foreign languages. Exporters are now seeking men to represent them in foreign countries and are offering big pay. This is your opportunity to cash in by studying these languages.

French, Spanish or German
Pocket size, cloth, each **$1.25**

Order Direct from This Page —on Our Money-Back Plan

The books listed above are only a few of the many in our catalogue, which you will receive promptly after filling out and mailing us the attached coupon. For quick action order direct from this page—cross name of each book wanted and send in with the price quoted. **We prepay postage and send books on our money-back plan.**

Frederick J. Drake & Co., *Publishers*
1008 Michigan Avenue CHICAGO, ILL.

Drake Books Are for Sale at All Book Stores

See Page 13 for Drake's List of Automobile Books

FREDERICK J. DRAKE & CO.
1008 Michigan Avenue, Chicago, Ill.

Please send me free, postage paid, your illustrated catalogue which lists and describes over 100 Practical Mechanical Books for Home Study.

My name is.....

And my address.....

.....

Don't Delay Write Today Now!

LEARN THE AUTOMOBILE TRADE

at home—spare times

WITH

Dyke's Working Models and Simplified Instructions

On these models you see the actual operation and learn more than you could from the auto itself—it's easy and quick. An **Auto Repairman** is not a machinist—his work consists of adjustments and refitting worn parts; "knowing the principle," that's the thing.

IF we **PROVE** *to you that students who took our Course are now actively engaged in business—you must admit you can do the same.*

WRITE NOW **For Dyke's FREE 32-Page Booklet**

It is interesting and instructive in itself. Learn how you can get all this training for only $18. The knowledge gained will be worth a hundred times its cost. Fill out below or write a postal—but do it now.

HOW TO GET INTO THE AUTO BUSINESS AND ITS OPPORTUNITIES

Dyke's Correspondence School of Motoring
Box 198, Granite Bldg., St. Louis, Mo.

Send me your free 32-page booklet about your New Idea Working Model Course and testimonials and proofs. It is understood I am under no obligations in sending for this.

Name .....
(WRITE PLAIN)

Town .....

Street ..... **State** .....

This school is a department of the firm A. L. Dyke, Publisher and Importer. Dyke's system is endorsed by leading motor authorities of the world. Dyke's Books are used by leading Auto Schools of U. S. and Canada. **Contractor to the Government during the war.**

You will understand ALL Electric Systems—6, 8, 12 Cyl.—Aero, Truck and Tractor Engines when you complete this course.

STEGER

The most valuable piano in the world

¶ The Steger piano is built with loving care by craftsmen whose ideals are expressed in its outward artistry and tone of unique beauty.

¶ Steger Pianos and Player Pianos are shipped to persons of responsibility! Write for Steger Style Brochure and convenient terms. Steger dealers everywhere.

STEGER & SONS PIANO MFG. CO.
Founded by John V. Steger, 1879
STEGER BUILDING, CHICAGO
Factories at Steger, Illinois

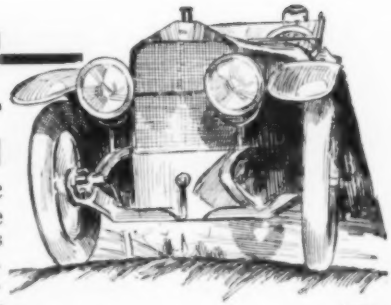
(Contents—Continued from Page 4)

Food Kept Cool without Ice 926
Gaskets, Cup Grease Keeps Soft 939
Gate Braced against Sagging 924
Grain Bag Holder, Milk Can Used as 925
Grinder, Dust Catcher for 937
Hacksaw Frames for Tight Places 924
Hens, Tethering Breaks of Sitting 938
Holder, Eraser, Made from Clothespin 933
Iodine for Scratches on Furniture 941
Jaws, Swivel, for Holding Wood in Iron Vise 939
Key Ring, Countersink Gauge on 937
Lamp Trouble, Tin Can Is Reflector for 942
Lathe Chucks, Grinding Jaws of 934
Lumber, Pattern, Knots in 939
Machines, Heavy, Tool for Turning by Hand 933
Paintbrush, Guard for 936
Plants, Garden, Straw Hat Protects 937
Plow for Garden Furrows 940
Poultry—Labor Saving Chicken Roosts 934
Punch Made from Old Pliers 935
Rat "Hallway" for Poultry Houses 926
Razor Hone, Fungus 936
Reamer for Cleaning Taper Holes 940
Roof, House, Irrigation Water Cools 925
Ruler, Draftsman's Bolt and Nut 941
Screwdrivers, Powerful 933
Socket for Taper Shank Twist Drills 932
Soldering Copper Has Jointed Handle 938
Sponge, Rubber, Cleans Wall Paper 938
Square Used as Level 939
Table and Bench, Combination 935
Telephone Cord Adjuster 937
Tubing, Rubber, Wire Prevents from Breaking 942
Valve Cages, Automobile, Removing 935
Well, Old, Used to Cool Drinking Fountains 926
Wire, Magnet, Removing Enamel from 940

AMATEUR MECHANICS

Animal, Pet, Carrier for 956
Automobile Radiator, Prevent Fan from Striking 955
Bait, Spinner, Made from Clothespin 957
Bird, Flying, Optical Illusion of 947
Boat, House, for Camping Parties 948
Bolt, Expansion, Made from Ordinary Bolt 946
Book Covers Made from Envelopes 951
Box for Keeping Food Hot at Picnic 954
Bread, Gauge for Slicing 959
Camera, Using Upside Down 950
Chain Used as Wire Grip 947
Checkbook, Canceled Checks Replaced in 955
Clock, Alarm, Hung on Costumer 953
Cuspidor, Holder for 955
Dock with Runway Adjustable to Water Level 944
Door, Rattling, Wood Block Prevents 946
Door, Screen, Cushion Prevents from Slamming 951
Door, Small, in Large One for Dog 953
Egg Beater, Holder for 952
Fan, Electric, Dispels Odors in Kitchen 957
Fish Jigger, Self-Acting 952
Fish Stringer, Use Key Ring at End of 951
Fly Paper, Hang Out of Way 951
Flytrap, Electrical, Flies Killed in 945
Flytrap Made from Cheese Box 955
Game, "Peggy," Exciting Outdoor 943
Goblet Made into Dinner Bell 945
Harrow, Garden, Homemade 944
Indicator, Tension, for Relay 950
Kitchen, Sleeping Compartment in 946
Lamp, Reading, Device for Holding on Wall 952
Leaks, Roof, Tobacco Smoke Locates 951
Magazines, Old, Used as Shingles 958
Match Scratcher on Bottom of Pipe 954
Medicine Dropper Made from Lamp Globe 955
Necktie Pressed without Iron 959
Negatives, Cracked, Photographing 959
Pail, Handy, Inner Tube Makes 952
Pen, Fountain, Filling by Suction 959
Pen, Lettering, Made from Ruling Pen 953
Picture Frame Joint, Strong 957
Pictures, Keeping Straight on Wall 947
Pliers Converted into Saw Set 956
Pocketknife, How to Open Easily 953
Press, Drill, with Adjustable Table 954
Razor Sharpener Attached to Sewing Machine 953
Scroll Saw Attachment 955
Silicates Form Chemical "Plants" 958
Sprayer, Barrel and Force Pump Make 945
Stickers, Gummed, How to Make 954
Stool Made from Scraps of Lumber 956
Trellis, Twisted Wires Support Plants on 950
Trowel, Garden, One Piece 957
Washer, How to Keep in Hose 947
Wood, Removing Dents from 956
Wrench Made of Sheet Iron 956

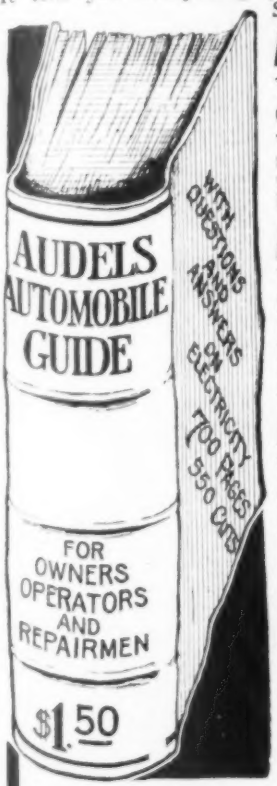
Know Your Car—



It Means Money to You

Audels Automobile Guide—the world's most scientific book on automobiles—will enable you to quickly solve every problem of driving, repairing, locating of trouble. It is recognized as the authority by experts. Its value is unlimited. It tells you everything you should know about your car.

Sent to you for free examination.



If you are an Owner

You are losing money every time you run with ill-adjusted Carburetor, with faulty ignition, with your engine at the wrong speed, or with a score of other faults. You may be a careful student of your car and take all the precautions you know of. But unless you know the technical details of driving and operation, and know them **right**, your car is an expense burden instead of a pleasure.

If you are a Chauffeur

We don't need to mention the things you must have at your fingers' ends in order to manage your car at top efficiency. Here are a few of the points you may be in doubt about:—How to care for batteries and keep them operating at maximum voltage. How to wire a car for Electric Starting, Lighting and Ignition according to the most modern systems. How to overhaul the car. How a car is best lubricated, etc.

If you are a Mechanician

Then more than anyone else you will realize the importance of knowing the details of design of every part of your car. New inventions in design and construction are coming up every day, which puzzle the untrained man. Do you know these things?—Methods of cooling—Timing and Balancing—Designing Clutches—Design of ball and roller bearings, etc.

Audels Automobile Guide

Solves every single one of these problems and solves them in a way that you can understand. It's a value you cannot afford to miss. It will save you many times its cost before you have had it a week.

Text Arranged in QUESTIONS AND ANSWERS

The story is told in the best known way,—in the form of questions you would ask and the answers to them—in plain, practical, everyday language, complete, concise, and to the point. The book is handsomely bound in durable full flexible leather, Pocket Size. It is easy to handle and easy to study. There are 30 chapters covering every single phase of Automobile engineering and Automobile operation. Every chapter is modern, concise, and practical.

Written *by* Practical Men *for* Practical Men

There is no idle theory in Audels Automobile Guide. Every paragraph is written to help you in the easiest, most practical way. The chapters on carburetors, ignition, gas-engine operation, How to run an Automobile, overhauling the car, Battery Troubles, and Starting and Lighting Systems, are alone worth the price asked for the 30 complete chapters. There are 700 information-full pages with 550 illustrations that show you in picture just what you want to see.

HERE ARE SOME OF THE SUBJECTS

Parts—Operation—Care—Management—Road Driving—Carburetor—Wiring—Timing—Ignition—Motor Trouble—Lubrication—Tires, etc. Chapters on Storage Batteries—Electric Vehicles—Overhauling Car—Special Chapter on Self-Starters and Lighting Systems, etc., etc., etc.

Sent to You *FREE*

We don't ask you to take our word for the merits of this book. Seeing is believing, so we will send you the book without deposit. You will say at once that as books go it is worth at least twice what we ask for it. Use it seven days in connection with your car. Then if you are not satisfied that Audels Automobile Guide is positively the best book on the subject, send it back to us. But if on the other hand you decide that you need it, that it is the one book for you, remit us only $1.50.

Mail This Free Coupon TODAY

Do not delay. Put your name and address on the coupon today. The book will be mailed to you at once for FREE examination. Convince yourself of the wonderful assistance this book will be to you Send for it today—now.

THEO. AUDEL & CO., 72 Fifth Ave., New York

FREE Examination Coupon

Theo. Audel & Co., 72 Fifth Ave., New York

Without obligation please mail for free examination "AUDELS AUTOMOBILE GUIDE." If I find it satisfactory I will remit $1.50. Otherwise return it to you.

Name.....

Occupation.....

Address..... Pop. Mech. June 1919

"You Get The Job"

"We've been watching you, young man. We know you're made of the stuff that wins. The man that cares enough about his future to study an I. C. S. course in his spare time is the kind we want in this firm's responsible positions. You're getting your promotion on what you *know*, and I wish we had more like you."

The boss can't take chances. When he has a responsible job to fill, he picks a man *trained to hold it*. He's watching ***you*** right now, hoping you'll be ready when your opportunity comes.

The thing for you to do is to start today and train yourself to do some one thing better than others. You can do it in spare time through the International Correspondence Schools. Over 5000 men reported advancement last year as a result of their I. C. S. training.

The first step these men took was to mark and mail this coupon. Make your start the same way—and make it right now.

TEAR OUT HERE

INTERNATIONAL CORRESPONDENCE SCHOOLS
BOX 5559B SCRANTON, PA.

Explain, without obligating me, how I can qualify for the position, or in the subject, *before* which I mark X.

- ☐ ELECTRICAL ENGINEER
- ☐ Electric Lighting and Railways
- ☐ Electric Wiring
- ☐ Telegraph Engineer
- ☐ Telephone Work
- ☐ MECHANICAL ENGINEER
- ☐ Mechanical Draftsman
- ☐ Machine Shop Practice
- ☐ Toolmaker
- ☐ Gas Engine Operating
- ☐ CIVIL ENGINEER
- ☐ Surveying and Mapping
- ☐ MINE FOREMAN OR ENGINEER
- ☐ STATIONARY ENGINEER
- ☐ Marine Engineer
- ☐ Ship Draftsman
- ☐ ARCHITECT
- ☐ Contractor and Builder
- ☐ Architectural Draftsman
- ☐ Concrete Builder
- ☐ Structural Engineer
- ☐ PLUMBING AND HEATING
- ☐ Sheet Metal Worker
- ☐ Textile Overseer or Supt.
- ☐ CHEMIST
- ☐ SALESMANSHIP
- ☐ ADVERTISING
- ☐ Window Trimmer
- ☐ Show Card Writer
- ☐ Sign Painter
- ☐ Railroad Trainman
- ☐ ILLUSTRATING
- ☐ Cartooning
- ☐ BOOKKEEPER
- ☐ Stenographer and Typist
- ☐ Cert. Public Accountant
- ☐ TRAFFIC MANAGER
- ☐ Railway Accountant
- ☐ Commercial Law
- ☐ GOOD ENGLISH
- ☐ Teacher
- ☐ Common School Subjects
- ☐ Mathematics
- ☐ CIVIL SERVICE
- ☐ Railway Mail Clerk
- ☐ AUTOMOBILE OPERATING
- ☐ Auto Repairing
- ☐ Navigation
- ☐ AGRICULTURE
- ☐ Poultry Raising
- ☐ Spanish
- ☐ French
- ☐ Italian

Name_____

Present Occupation_____

Street and No._____

City_____ State_____

Please Mention Popular Mechanics

See the World

Our correspondence course in wireless fits you for merchant marine, land stations, army and navy. Positions pay $110 per month and living expenses, up to $3500.

Expert Government Licensed Instructors

Largest Radio School in America

Special Profit Sharing Plan for Benefit of Students, Guaranteeing Considerable Reduction in Cost of Tuition

Free Post Graduate Course in Our Washington School

Don't delay, but write today for handsomely illustrated booklet and details of profit sharing plan.

Service Radio School
Dept. H, 902 Pa. Ave., Washington, D.C.

FREE 10 LESSONS In Public Speaking

Write for particulars of this extraordinary offer. 10 lessons in public speaking absolutely free. Remarkable opportunity. Become a powerful speaker in spare time by mail. Overcome "stage fright," enlarge your vocabulary, train your memory, gain self-confidence. Increase your earning power, popularity. We have trained hundreds.

Offer Limited This offer is made strictly for advertising purposes and may be withdrawn at any time. Write at once, while this **free lesson offer lasts.** Big saving if you act now.

NORTH AMERICAN INSTITUTE, 119A Manhattan Bldg., Chicago, Ill.

I won **World's First Prize for best course in Penmanship.** Under my guidance you can become an expert penman. Am placing many of my students as instructors in commercial colleges at high salaries. If you wish to become a better penman, write me. I will send you FREE one of my **Favorite pens** and a copy of the Ransomerian Journal. Write today. **C. W. Ransom,** 476 Essex Bldg., **Kansas City, Mo.**

WANTED — Railway Mail Clerks

Men — Boys, 18 to 35
$1100 to $2000 Year
Common Education Sufficient
Sure Pay. Life Job. Pull Unnecessary.

COUPON

Franklin Institute
Dept. F 94, Rochester, N. Y.

Sirs: Send me, without charge, (1) sample Railway Mail Clerk Examination questions; (2) schedule showing places of all U. S. Government coming examinations; (3) list of other government jobs now open, and (4) free book describing them.

NAME. .....

ADDRESS .....

My Way of Teaching Piano Made Plenty of Enemies

All the old fogeys who are down on anything new—especially correspondence study—made it pretty hard for me when I first started 25 years ago.

And the fact that in spite of their opposition I *obtained more students every year* seems to me pretty good evidence that my method isn't wholly bad.

I now have far more students than were ever before taught by one man. There isn't a State in the Union that doesn't contain a score or more skilled players of piano or organ who obtained their *entire* training from me. They learned *in quarter the usual time and at quarter the usual cost.* I will gladly refer you to any number who will soon convince you of the excellent results they gained from my instruction. My free booklet, "How to Learn Piano or Organ," will interest and inform you. But don't send for it if you're afraid of being convinced.

My way of teaching piano or organ is entirely different from all others. Out of every four hours of study, one hour is spent *entirely away from the keyboard*—learning something about Harmony and The Laws of Music. This is an awful shock to most teachers of the "old school," who still think that learning piano is solely a problem of "finger gymnastics." When you *do* go to the keyboard, you accomplish *twice as much,* because you *understand what you are doing.* Within four lessons I enable you to play an interesting piece not only in the original key, but in all other keys as well.

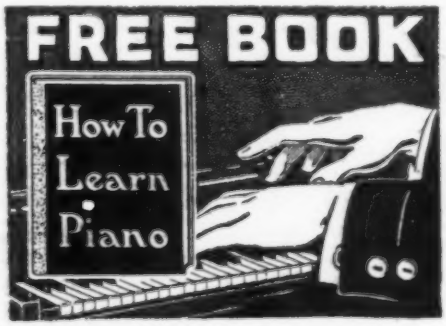
I make use of every possible scientific help—many of which are entirely unknown to the average teacher. My patented invention, the COLOROTONE, sweeps away playing difficulties that have troubled students for generations. By its use transposition—usually a "nightmare" to students—becomes easy and fascinating. With my fifth lesson I introduce another important and exclusive invention, QUINN-DEX. Quinn-Dex is a simple hand-operated moving picture device, which enables you to see, right before your eyes, every movement of my hands at the keyboard. You actually see the fingers move. Instead of having to reproduce your teacher's finger movements from MEMORY—which cannot be always accurate—you have the correct models before you during every minute of practice. The COLOROTONE and QUINN-DEX save you months and years of wasted effort. They can be obtained only from me and there is nothing else, anywhere, even remotely like them.

Men and women who have failed by all other methods have quickly

DR. QUINN AT HIS PIANO—From the famous sketch by Schneider, exhibited at the St. Louis Exposition.

and easily attained success when studying with me. In all *essential* ways you are in closer touch with me than if you were studying by the oral method—yet my lessons cost you only 43 cents each—and they include all the many recent developments in scientific teaching. For the student of moderate means, this method of studying is *far superior* to all others, and even for the wealthiest student there is nothing *better* at *any* price. You may be certain that your progress is at all times in accord with the best musical thought of the present day, *and this makes all the difference in the world.*

My Course is endorsed by distinguished musicians who would not recommend any course but the best. It is for beginners or experienced players, old or young. You advance as rapidly or as slowly as you wish. All necessary music is supplied without extra charge. A diploma is granted. Write today, without cost or obligation, for 64-page free booklet, "How to Learn Piano or Organ."



FREE BOOK COUPON

QUINN CONSERVATORY, Studio KS
Social Union Bldg., Boston, Mass.

Please send me, without cost or obligation, your free booklet, "How to Learn Piano or Organ," and full particulars of your Course and special reduced Tuition offer.

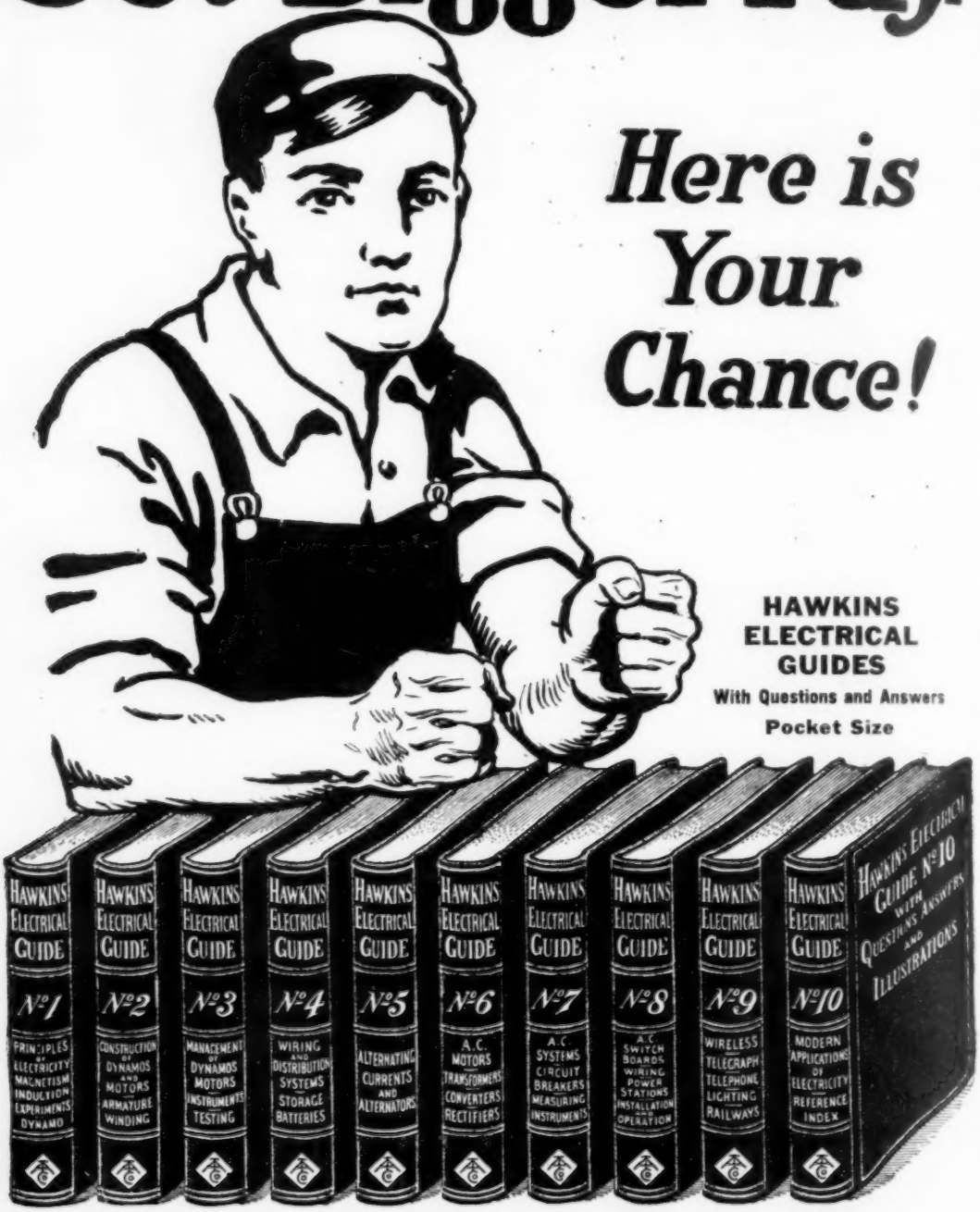
Name.....

Address.....

.....

Marcus Lucius Quinn Conservatory of Music
Studio KS, Social Union Bldg. BOSTON, MASS.

Get Bigger Pay.



HAWKIN'S ELECTRICAL GUIDES ANSWER YOUR QUESTIONS

through ELECTRICITY

ELECTRICITY is the biggest force in the world today—and it is growing bigger every day. Electrical experts get big pay and hold big jobs. The electrical field offers you wonderful opportunities for success. **Here is your chance.**

What you need is specialized knowledge to master electrical forces and command the high salaries of an electrical expert. Success in electricity will come through your ability to acquire and use the specialized knowledge of others—this knowledge is collected and condensed in Hawkins Electrical Guides.

Every mechanic, every electrician, every engineer and every student should have these wonderful books. **YOU** should get them—just think how much they will help you. No matter what branch of electrical work you follow, in Hawkins Electrical Guides you always have at hand for ready reference or study, a wonderful work containing 4700 illustrations and 3500 pages which cover all the subjects, principles, theories, practices, problems, troubles and ways of doing things electrically. Hawkins Electrical Guides are a complete practical working course in applied electricity.

The set contains ten wonderfully helpful and practical volumes—written in clear, concise language—easy to understand—large type—no wasted words—full of up-to-the-minute electrical knowledge which you can apply to every problem that comes up. Every electrical question you can ask is answered by the Guides and every subject is indexed so that you can turn to it **instantly.**

The Guides have made good. Hundreds upon hundreds of men—beginners, experts, students and engineers—have been aided, advanced and encouraged by these wonderful little instructors. Hawkins Electrical Guides will help **you** get bigger pay through electricity.

Hawkins Electrical Guides

Do you want to know the facts about the following electrical subjects? They are all covered in Hawkins Electrical Guides.

Electrical signs and symbols—static and current electricity—primary cells—conductors and insulators—resistance and conductivity—magnetism—induction coils—dynamo principles—classes of dynamos—armatures—windings—commutator brushes. Motor principles—armature reaction—motor starting—calculations—brake horsepower—selection and installation of dynamos and motors—galvanometers—standard cells—current measurement—resistance measurement—voltmeters—wattmeters—watthour meters—operation of dynamos—operation of motors. Distribution systems—wires and wire calculations—inside, outside and underground wiring—sign flashers—lightning protection—rectifiers—storage battery systems. Alternating current principles—alternating current diagrams—the power factor—alternator principles—alternator construction—windings. A. C. Motors—synchronous and induction motor principles—A. C. commutator motors—induction motors, transformers; losses, construction, connections, tests—converters—rectifiers. Alternating current systems—switching devices—circuit breakers—relays—lightning protector apparatus—regulating devices—synchronous condensers—indicating devices—meters—power factor indicators—wave form measurement—switch boards. Alternating current, wiring power stations—turbines: management, selection, location, erection, testing, running, care and repair—telephones. Telegraph—simultaneous telegraphy and telephony—wireless—electric bells—electric lighting—photometry. Electric railways—electric locomotives—car lighting—trolley car operation—miscellaneous applications—motion pictures—gas engine ignition—automobile self-starters and lighting systems, electric vehicles. Elevators—cranes—pumps—air compressors—electric heating—electric welding—soldering and brazing—industrial electrolysis—electro-plating—electro-therapeutics—X-rays.

Also a complete 126-page ready reference index of the complete library. This index has been planned to render easily accessible all the vast information contained in the 10 Electrical guides. There are over 13,500 cross references. You find what you want to know instantly.

4,700 Pictures—Flexible Covers
3,500 Pages—Pocket-size

The Guides fit your pocket. You can carry a number about with you till you have mastered its contents. All subjects are indexed so that you can find the information instantly. Written in the modern question and answer form. It's like having a famous electrical authority always at your elbow ready to answer any question you ask.

Shipped to You FREE

Send no money. Examine the books first—use them in your work—pick up some information that will increase your earning ability. Decide for yourself that they are the most complete and clearly written electrical books ever published. Every book is complete in itself but the entire set is the best bargain. Accept this unusual offer now—mail the coupon today. If you decide to keep the books you can make settlement at only $1 per month, until paid for.

THEO. AUDEL & CO.
72 Fifth Ave.
New York, N.Y.

Please submit me for examination **Hawkins Electrical Guides (price $1 each).** Ship at once, prepaid, the 10 numbers. If satisfactory I agree to send you $1 within seven days and to further mail you $1 each month until paid.

Signature .....

Occupation .....

Employed by .....

Residence .....

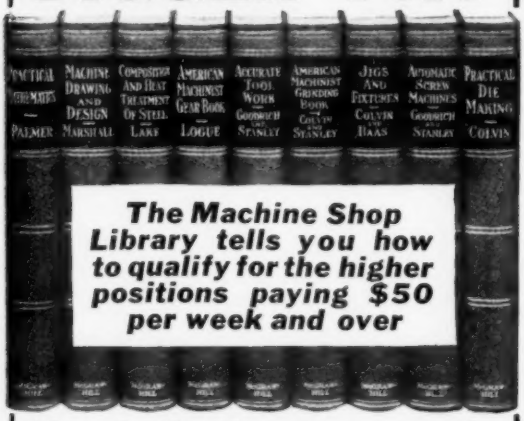
Reference ..... P.M. June '19

THEO. AUDEL & COMPANY 72 FIFTH AVE. NEW YORK

$1 a number
$1 a month

FREE EXAMINATION COUPON

$2 per month
starts you to
BIGGER PAY



The Machine Shop Library tells you how to qualify for the higher positions paying $50 per week and over

Now is the time to get ready

Never before in history has there been such a demand for capable machine shop workers. Don't take our word for this. The evidence is seen on every side.

Average workers are drawing up to $50 per week, while men who are equipping themselves with a technical knowledge are earning much more. $100 per week is not unusual for the specialist.

Eight nationally known authors, all practical men, wrote the Machine Shop Library. These men were assisted in completing these records of actual practice by over two hundred experts.

3000 pages of plainly stated facts, and 3300 illustrations, forming a set of books that makes promotion sure.

Sent without deposit— Just return the coupon

Fill out the coupon below right now. Examination of these nine volumes is absolutely free. After seeing the books you will then know why they are accepted as the standard in America, and why they are helping thousands of men fill the big positions.

Free Examination Coupon

McGraw-Hill Book Co., Inc., 239 W. 39th St., New York

GENTLEMEN:—I am interested in your Machine Shop Library. You may send me the nine volumes, charges paid, for my inspection. If satisfactory, I will send $2 in ten days and $2 per month until I have paid the price of the books, $16. If the books are not what I want, I will write you for shipping instructions.

SIGNATURE.....

HOME ADDRESS.....

CITY AND STATE.....

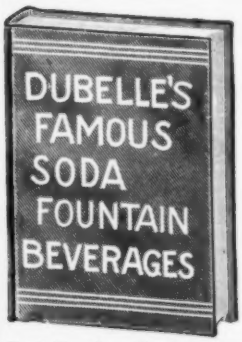
NAME OF EMPLOYER.....

HIS ADDRESS.....

YOUR POSITION.....P.M.June'19

Please Mention Popular Mechanics

GOOD DRINKS
at SMALL COST



Over 500 Recipes

for Fruit Syrups, Fruit Essences, Fruit Phosphates, Soluble Flavoring Extracts and Essences, Fruit Punches, Fruit Champagnes, New Lemonades, Soluble Bitters Extracts, and many other delicious Beverages.

Mailed Post-paid, for **$1.65**

SPON & CHAMBERLAIN 123 P. M. Liberty St. NEW YORK, U. S. A.

THE AMERICAN BOY

"The Biggest, Brightest, Best Magazine for Boys in All the World"

It's Great Stuff! A lot of fathers of subscribers to *The American Boy* magazine read it too. Because it's practical—it's alive. It's a regular magazine, edited and written for you with all kinds of departments and the best kind of fiction. You probably know this, though. If you don't, ask dad to bring you home a copy.

$2.00 a year—20c a copy on news-stands.

THE SPRAGUE PUBLISHING CO.
27 American Bldg. Detroit, Mich.

If you are earning less than
$50.00 PER WEEK
and like to draw — you should study
COMMERCIAL ART

Leading Art Managers—the men who know—recommend us and employ our students. We will guarantee to make you successful—Learn at home in your spare time—or in our resident school—Day or evening. Write for FREE illustrated catalogue.

Commercial Art School, 720, 116 So. Michigan Ave., Chicago, Ill.

LEARN
PARAGON SHORTHAND
IN SEVEN DAYS

Sent on 7 days' free trial. If you wish to keep it, mail us $5.00; if not, remail the Course to us and you will owe nothing.

Paragon Institute Home Study Dept.
601 Broad St., Suite 391, Newark, N. J.

Improve Your Memory

THE Pelman Mind and Memory Course gives a better memory, trains observation, strengthens will power, gives self-confidence, develops initiative, originality, builds up an all-round mental and physical efficiency. Requires only a few minutes a day. Write for free booklet.

PELMAN INSTITUTE *Dept. P,* Toronto, Can.

Drake's Practical Automobile Books

FOR HOME STUDY

Nothing like these books for accurate information—handy—complete—easy to understand. Make repairs, care and upkeep of automobiles and gas engines simple as A B C. Brought right up to date. Invaluable to dealers, garage men, repair men and automobile owners. Order direct from this advertisement on 5-day money-back plan.

Brookes' Automobile Handbook By L. E. BROOKES. 1919 edition, edited by H. P. Manly. 700 pages, 339 illustrations and diagrams. Covers all latest developments, automobiles and trucks. Methods of upkeep, care and repair, construction and operation. Pocket size, leatherette, gold stamping **$2.00**

Automobile Ignition By HAROLD P. MANLY. Covers operation, upkeep, care and repair of all types of storage battery and magnetic ignition equipment, detailed instructions for adjustment, timing and testing. 439 pages, 193 illustrations, 98 wiring diagrams. Pocket size. Leatherette, gold stamping **$2.00**

Automobile Starting and Lighting By HAROLD P. MANLY. 340 pages, fully illustrated. 1919 edition. Charging rates and internal wiring diagrams of all systems. Explains all types of construction, covers thoroughly operation of dynamos, motors, storage batteries, regulators, cut-outs. Pocket size, leatherette, red edge, gold stamping **$1.50**

The Ford Motor Car and Truck and Tractor Attachments By HAROLD P. MANLY. Covers every feature of the Ford adjustments, repairs, upkeep and care. Pocket size, 256 pages, fully illustrated. Leatherette, red edges, gold stamping **$1.50**

Automobile Catechism and Repair Manual By CALVIN F. SWINGLE and H. A. TARANTOUS. Comprises over 400 questions and answers on the construction, care and operation of the automobile. Pocket size, leatherette, stamped in gold. Red edges. 165 pages. Fully illustrated. Price **$1.25**

Practical Gas and Oil Engine Handbook Complete manual of useful and practical information on the care, maintenance and repairs of gas and oil engines. With special reference to the DIESEL and other new oil engines. By L. E. BROOKES. 270 pages, 81 illustrations. Pocket size **$1.50**

Traction Farming and Traction Engineering By J. H. STEPHENSON, M. E. New and enlarged edition of care and operation of gas and oil farm engines, with special attention to all the new light tractors, including the "caterpillar" type. 412 pages, 175 illustrations, 12 mo. cloth. Price **$1.50**

MAIL THE COUPON

Order direct from this page—on our money-back plan. Cross name of each book wanted and send in with the price quoted. We prepay postage and send the books on our money-back plan—keep the books five days; if not entirely satisfied return them and money will be refunded immediately. **Order Now.**

FREDERICK J. DRAKE & CO.
PUBLISHERS
1005 Michigan Avenue, CHICAGO, ILL.

Drake Books Are for Sale at All Bookstores

For Other Drake Books See Page 5

Frederick J. Drake & Co.,
1005 Michigan Ave., Chicago, Ill.

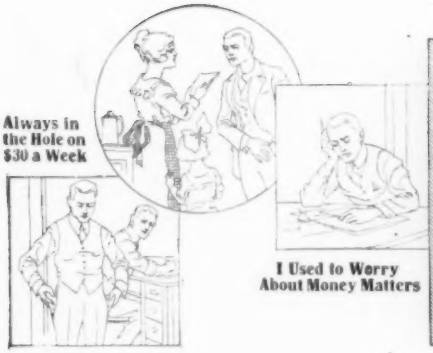
Enclosed find ($), for which please send me prepaid the books checked in this adv. (or list attached). It is agreed that I may return same in five days if not entirely satisfied, and money will be refunded in full.

Name .....

Address .....

Order Direct From This Page — On Our Money-Back Plan

Write for FREE Illustrated Catalog



Always in the Hole on $30 a Week

I Used to Worry About Money Matters

"At Dawn the Answer Flashed on Me!"

I Now Own a $25,000 Home

Go Traveling Whenever I Want to

—And Live in Luxury

How a young man jumped from $30 a week to $50,000 a year. His remarkable success he attributes to the way he uses his will. "What I've done, I believe any one can do," he says.

THERE are only a few $50,000 jobs—yet of all the men in the country it is difficult to find enough to fill the few big jobs available. There are plenty of men for the $25-a-week positions—but the thousand-dollar-a-week openings "go begging." How this young man trained himself for earnings of $50,000 a year is one of the most interesting chapters in the annals of even present-day fortune-making. This is the story told me, almost word for word, by the young man *who did it*.

"Three short years ago I was $5,000 'in the hole'—and earning $30 a week. I had a wife and two children to support, and I used to worry myself sick about the future.

"To-day—it seems like a dream—all my troubles are over. I am worth $200,000—enough to keep me and my family in comfort for the rest of our lives. I own two automobiles. My children go to private schools. I have just purchased, for cash, a $25,000 home. I go hunting, fishing, motoring, traveling, whenever I care to.

"LET me say in all sincerity that what I have done I believe any one can do. I am only an average man—not 'brilliant'—have never gone to college—my education is limited. I know at least a hundred men who knew more than I, who are better educated and better informed—and their earnings probably average less than $50 weekly while my income is over $1,000 weekly. I mention this to show that earning capacity is not governed by the extent of a man's education—to encourage those who have not had the advantage of a comprehensive education.

"What, then, is the secret of my success? Let me tell you how it came about.

"One day, about three years ago, something happened that woke me up to what was wrong with me. It was necessary for me to make a decision on a matter which was of little consequence. I knew in my heart what was the right thing to do, but something held me back. I said one thing, then another; I decided one way, then another. I couldn't for the life of me make the decision I knew was right.

"I lay awake most of that night thinking about the matter—not because it was of any great importance in itself, but because I was

beginning to discover *what was wrong with me*. Along towards dawn the answer flashed on me and I resolved to make an experiment. I decided to cultivate my will power, believing that if I did this I would not hesitate about making decisions—that when I had an idea I would have sufficient confidence in myself to 'put it over'—that I would not be afraid of myself or of things or of others. I felt that if I could smash my ideas across I would soon make my presence felt. I knew that heretofore I had always begged for success—had always stood, hat in hand, depending on others to give me the things I desired. In short, I was controlled by the will of others. Henceforth, I determined to have a strong will of my own—*to demand and command what I wanted.*

"WITH this new purpose in mind, I applied myself to finding out something more about will power, and in my investigation I encountered the works of Professor Frank Channing Haddock. To my amazement and delight, I discovered that this eminent scientist, whose name ranks with James, Bergson and Royce, had completed the most thorough and constructive study of will power ever made. I was astonished to read his statement, 'The will is just as susceptible of development as the muscles of the body!' My question was answered! Eagerly I read further—how Dr. Haddock had devoted twenty years to this study—how he had so completely mastered it that he was actually able to set down the very exercises by which any one could develop the will, making it a bigger, stronger force each day, simply through an easy, progressive course of training.

"It is almost needless to say that I at once began to practice the exercises formulated by Dr. Haddock, and I need not recount the extraordinary results that I obtained almost from the first day. You already know the success that my developed power of will has made for me.

"People sometimes worry because they cannot *remember;* or because they cannot *concentrate*. The truth is, will power will enable them to do *both*. The man who can use his will can not only concentrate and remember but can *make use* of these two faculties. And I want to leave this one word with you—no knowledge, no plan, no idea is worth a penny unless it is used—and it cannot be used unless some one's power of will does it!"

PROF. HADDOCK'S rules and exercises in will training have been placed in book form, and I have been authorized by the publishers to say that any reader who cares to examine his startling book on will power may do so without sending any money in advance. In other words, if after a week's reading you do not feel that "Power of Will" is worth $3, the sum asked, return it and you will owe nothing.

When you receive your copy for examination I suggest that you first read the articles on: The law of great thinking; How to develop analytical power; How to guard against errors in thought; How to drive from the mind unwholesome thoughts; How to develop fearlessness; How to use the mind in sickness; How to acquire a dominating personality.

It is interesting to note that among the 225,000 owners who have read, used and praised "Power of Will" are such prominent men as Judge Ben B. Lindsey; Supreme Court Justice Parker; Wu Ting Fang, ex-U. S. Chinese Ambassador; Gov. McKelvie of Nebraska; Assistant Postmaster-General Britt; General Manager Christeson, of Wells Fargo Express Co.; E. St. Elmo Lewis; Senator Arthur Capper, of Kansas, and thousands of others.

As a first step in will training, I would suggest immediate action in this matter before you. It is not even necessary to write a letter. Use the blank form below, if you prefer, addressing it to the Pelton Publishing Company, 13-K Wilcox Block, Meriden, Conn., and the book will come by return mail. This one act may mean the turning point of your life as it has meant to me and to so many others.

Pelton Publishing Company
13-K Wilcox Block, Meriden, Conn.

I will examine a copy of "Power of Will" at your risk. I agree to remit $3 or remail the book in 5 days.

Name .....

Address .....

.....

Finish This Story For Yourself—

The girl got $6 a week and was lonely. "Piggy"—you can imagine his kind—was waiting downstairs. He knew where champagne and music could be had. But that night she didn't go. That was Lord Kitchener's doing. But another night?

O. Henry

(12 Volumes)

tells about it in this story, with that full knowledge of women, with that frank facing of sex, and that clean mind that has endeared him to the men and women of the land.

Great Story Writer

From the few who snapped up the first edition at $125 a set before it was off the press, to the 120,000 who have eagerly sought the beautiful volumes offered you here—from the professional man who sits among his books to the man on the street and to the woman in every walk of life—the whole nation bows to O. Henry—and hails him with love and pride as our greatest writer of stories.

451 Short Stories
2 Long Stories
O. HENRY
12 volumes bound in beautiful New Half Fabrikoid, Gold tops; illustrated; 274 complete stories; one long novel.
JACK LONDON
5 volumes, silk cloth binding, given away
FREE

To Those Who Are Quick

Jack London 5 vols. Given Away

Never was there an offer like this. Not only do you get your 274 O. Henry stories in 12 volumes at less than others paid for one volume of the first edition, but you get Jack London's Works, 5 handsome volumes—without paying us a cent. You get 17 volumes of love and laughter—a big shelf full of handsome books.

SHIPPED ON APPROVAL

We will ship the two complete sets so that you can look them over in your home and then decide whether or not you wish to buy. If you are not delighted with O. Henry and the free Jack London notify us and we will take the sets back as cheerfully as we sent them. How could any offer be more fair?

INSPECTION COUPON

THE RIVERSIDE PUBLISHING CO. (6-19)
543 Marquette Bldg., Chicago, Ill.

Please ship me on approval the Works of O. Henry, 12 volumes, New Fabrikoid binding, gold tops. Also the 5 volume set of Jack London bound in silk cloth. If I keep the books I will pay you $1.00 as first payment within 10 days after **books** are received and $2.00 per month until your special price of $25.00 for the O. Henry set only is paid, and it is agreed I am to retain the Jack London set without charge. If not satisfactory I will notify you within 10 days and return both sets to you as soon as you give me shipping instructions as offered readers of **Popular Mechanics.**

Name.....

Address.....

Business or Employer.....

Please Mention Popular Mechanics

Copy this Sketch

and let me see what you can do with it. If you like to draw, my practical system of personal individual lessons by mail will develop your ability. **A large proportion of the newspaper artists who are gaining success today were trained by this course.** Cartoonists and illustrators earn $25 to $125 or more per week, and new opportunities are constantly opening up.

Landon Picture Charts

make *Original Drawing* easy to learn. Every step is explained clearly *by pictures.* You learn to draw as easily as you learned to write. Send sketch of Uncle Sam with 6c in stamps for sample Chart, full information about the course, list of successful pupils, examples of their work, and evidence of what you too can accomplish. *Please state your age.*

The Landon School

of CARTOONING and ILLUSTRATING
1338 Schofield Bldg. Cleveland, Ohio

BE A C.P.A. ACCOUNTANCY
The Highest Paid Profession taught thoroughly in a few months of home study by new system
FREE BOOK International Accountants Society 127 2626 S. Michigan Ave., Chicago

---

CASH PAID For BUTTERFLIES, INSECTS
The work is simple with my price-list, pictures, descriptions, and instructions. Hundreds of kinds wanted for collections, colleges and museums. Send 4 cents at once for prospectus.
Sinclair, Dealer in Insects, D-6, Ocean Park, Calif.

Be a Finger Print Expert

FINGER PRINTS

Police departments, factories and industries everywhere are adopting this system of identification. Experts needed at once. You can train yourself in spare time at home. Write for details.

Free Book—Write Valuable and interesting book on finger prints sent absolutely free and prepaid. Also details of special limited offer. Write at once, while this offer lasts.

UNIVERSITY OF APPLIED SCIENCE
Desk A119 1772 Wilson Avenue, CHICAGO

Let Me train YOU in AVIATION

Capt. G. F. Campbell, Formerly Third Ace of the Royal Flying Corps.

My advice to you is to start right now to take my

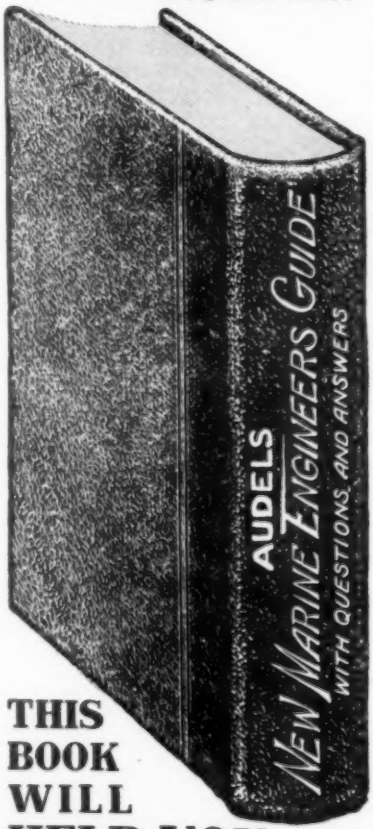
Home Course in Aviation

and prepare to fill one of the big jobs later. Wonderful opportunities. **Trained men in big demand.** Prepare now for big future. Lessons are easy to understand. Write TODAY for my FREE BOOK, "The Science of Aviation," and I will send it and write you a personal letter that will interest you. Address:

CAPT. GEO. F. CAMPBELL, Chief Instructor
National Aero Institute, 916 S. Michigan Ave., Dept. 1196, Chicago

Marine ENGINEERS Guide

Read this



YOU must see this Guide to appreciate it

—

Pocket Size

—

Flexible Black Covers

—

Gold Edges

—

850 Pages

—

600 Illustrations

—

Reference Index

—

Printed in large clear type

—

PRICE **$3**

EVERY day the yards are turning out ships—ships—and still more ships. There is an ever growing demand for men to operate the engines, boilers, and auxiliary machinery of this vast Naval and Merchant Marine. To assist these good men we have published a new Marine book. It is written in plain every-day language, concise, to the point, and easy to understand. It deals thoroughly with the fundamental principles of Marine Engineering and it explains in complete detail the standard construction and operation of marine machinery.

AUDEL'S MARINE ENGINEERS' GUIDE

Every Engineer, Assistant Engineer, Marine Fireman, Machinist and Student should have this new text-book and reference guide to increase his working knowledge and to master the theory and practice of Marine Engineering in all its branches.

Subjects Covered in the Guide

How to Figure (with examples), Safety Valve Rules, Horse Power Rules, Theory and Elements of Engineering, Steam Tables, Marine Boilers, Oil Burners, Marine Engines, Turbines, Pumps and Condensers, Injectors and Heaters, Steering Engines, Pipes and Piping, Auxiliary Machines, General Care and Management with Suggestions, Breakdowns and Repairs at Sea, Overhauling and Laying Up, Gasoline Engines, Gas Producers, Heavy Oil Engines, Diesel Engines, Dynamos and Motors, Electric Ship Propulsion, Refrigerating Machinery, Government Rules and Regulations Relating to Engineers' Certificates and Many Useful Questions and Answers Covering Practical, Modern and Approved Marine Practice.

THIS BOOK WILL HELP YOU

FREE EXAMINATION COUPON

THEO. AUDEL & COMPANY 72 FIFTH AVE. NEW YORK

USE PENCIL

THEO. AUDEL & CO.
72 Fifth Ave.
New York, N.Y

Please send me Audel's New Marine Engineers' Guide (Price $3.00), if satisfactory I will remit $1.00 on its safe arrival, $1.00 in 30 days and the last $1.00 in 60 days. Otherwise I will return the book.

USE PENCIL

Name .....

Occupation .....

Employed by .....

Residence ..... Pop. Mech. June, 1919

"I'm as Good a Man as Jim!"

"They made him manager today, at a fine increase in salary. He's the fourth man in the office to be promoted since January. And all were picked for the same reason—they had studied in spare time with the International Correspondence Schools and learned to do some one thing better than the rest of us.

"I've thought it all out, Grace. I'm as good a man as any one of them. All I need is special training—and I'm *going to get it*. If the I. C. S. can raise other men's salaries it can raise *mine*. If it can bring a better home with more comforts to Jim and his family it can do it for *us*. See this coupon? It means *my* start toward a better job and I'm going to mail it to Scranton tonight!"

Thousands of men now know the joy of happy, prosperous homes because they let the International Correspondence Schools prepare them in spare hours for bigger work and better pay. You will find them in offices, shops, stores, mills, mines, factories, on railroads—everywhere.

Why don't *you* study some one thing and get ready for a real job, at a salary that will give *your* wife and children the things you would like them to have?

You can *do* it! Pick the position you want in the work you like best and the I. C. S. will prepare you for it right in your own home, in your spare time—you need not lose a day or a dollar from your present occupation.

Yes, you *can* do it! More than two million have done it in the last twenty-eight years. More than 100,000 are doing it right now. Join them without another day's delay. Mark and mail this coupon!

TEAR OUT HERE

INTERNATIONAL CORRESPONDENCE SCHOOLS
BOX 5558-B, SCRANTON, PA.

Explain, without obligating me, how I can qualify for the position, or in the subject, *before* which I mark X.

- ☐ ELECTRICAL ENGINEER
- ☐ Electric Lighting and Railways
- ☐ Electric Wiring
- ☐ Telegraph Engineer
- ☐ Telephone Work
- ☐ MECHANICAL ENGINEER
- ☐ Mechanical Draftsman
- ☐ Machine Shop Practice
- ☐ Toolmaker
- ☐ Gas Engine Operating
- ☐ CIVIL ENGINEER
- ☐ Surveying and Mapping
- ☐ MINE FOREMAN OR ENGINEER
- ☐ STATIONARY ENGINEER
- ☐ Marine Engineer
- ☐ Ship Draftsman
- ☐ ARCHITECT
- ☐ Contractor and Builder
- ☐ Architectural Draftsman
- ☐ Concrete Builder
- ☐ Structural Engineer
- ☐ PLUMBING AND HEATING
- ☐ Sheet Metal Worker
- ☐ Textile Overseer or Supt.
- ☐ CHEMIST
- ☐ SALESMANSHIP
- ☐ ADVERTISING
- ☐ Window Trimmer
- ☐ Show Card Writer
- ☐ Sign Painter
- ☐ Railroad Trainman
- ☐ ILLUSTRATING
- ☐ Cartooning
- ☐ BOOKKEEPER
- ☐ Stenographer and Typist
- ☐ Cert. Public Accountant
- ☐ TRAFFIC MANAGER
- ☐ Railway Accountant
- ☐ Commercial Law
- ☐ GOOD ENGLISH
- ☐ Teacher
- ☐ Common School Subjects
- ☐ Mathematics
- ☐ CIVIL SERVICE
- ☐ Railway Mail Clerk
- ☐ AUTOMOBILE OPERATING
- ☐ Auto Repairing
- ☐ Navigation
- ☐ AGRICULTURE
- ☐ Poultry Raising
- ☐ Spanish
- ☐ French
- ☐ Italian

Name_____

Present Occupation_____

Street and No._____

City_____ State_____

Canadians may send this coupon to International Correspondence Schools, Montreal, Canada

Please Mention Popular Mechanics

DETROIT
the Automobile Center of the World is the Logical Place to

LEARN AUTOMOBILE ELECTRICS

Auto Electricians are in big demand everywhere. Men trained in Detroit get the preference. The work is interesting and pays big salaries. Every garage, factory and service station needs one or more good men. There are plenty of splendid opportunities to open electrical service stations and make big money. Cars need constant attention. Nearly all the trouble is electrical. Six million cars now in use—a million and a half new ones will be put in service this year.

AUTO ELECTRICIANS Earn From $200 to $500 Monthly

If you are electrically inclined this is your best opportunity. Our complete Auto Course trains you thoroughly in Auto Electrics. You can hold down **any** job or run a business of your own. You make more money because you can locate trouble quickly, without waste of time. All your time is spent repairing the trouble; not looking for it. Our successful graduates are in every part of the world.

Auto Factories Heartily Endorse School

They not only endorse the M. S. A. S., but give the keenest co-operation. They employ our students while taking course and after they graduate. We have the latest model chassis for students to work on. This is not a "One Man School;" it embodies the best ideas in the Auto Industry. School open all the year, enter classes any day.

"School News" and Catalog Absolutely FREE

Get a big salary for what you KNOW. Write now for 176 page Catalog and "Auto School News" just off the press, all absolutely FREE. Hundreds have "jumped" on a train and come to Detroit without writing. We can get you a job to help pay expenses if you desire. ACT NOW.

AMERICA'S MOST PROGRESSIVE SCHOOL

MICHIGAN STATE AUTO SCHOOL

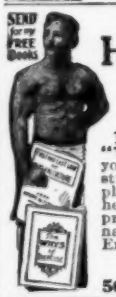
The Old Reliable School — A. G. ZELLER, Pres.
Automobiles, Trucks, Tractors, Aeroplanes
2926 Auto Bldg. 687-91 Woodward Ave. Detroit, Mich. U.S.A.

Money-Back Guarantee

We guarantee to qualify you for a position as chauffeur, repair man, tester, demonstrator, auto electrician, garage man, automobile dealer, Aeroplane motor mechanic or tractor mechanic and operator, paying $200 to $500 monthly or refund your money.

LEARN WATCHMAKING AND ENGRAVING

Earn while learning. Most practical watch school. Individual instructions. Graduates in great demand. Book free. Chicago School of Watchmaking, Dept. 20, State-Lake Bldg., Chicago



Do You Want to Know HOW TO DEVELOP

Vitality, Energy, Endurance, Nerve Strength, Muscular Strength, Perfect Physique?

My FREE BOOKS, **"The Whys of Exercise"** and **"The First and Last Law of Physical Culture,"** tell you, if you are weak or underdeveloped, how to grow strong; if strong, how to grow stronger. They explain how to develop the lungs and muscle, the strong heart and vigorous digestion—in short, how to improve health and strength internally as well as externally. SEND TODAY—NOW—for these FREE BOOKS. Enclose 4c in stamps to cover postage.

PROF. H. W. TITUS
56-58 Cooper Sq. Dept. 1003 New York City

Learn How to WRESTLE
In Your Own Home By Mail

Yes, learn to become an expert wrestler right in your own home, by mail, from the greatest wrestlers the world has ever known. Be an athlete, be strong, be healthy. Learn how to throw and handle big men with ease. Learn to **defend yourself.** All taught in our course of lessons, and illustrated with hundreds of charts and actual photographs by

Farmer Burns and Frank Gotch

Farmer Burns, "the grand old man of the mat," taught Frank **Gotch,** the **World's Champion,** all he knew about wrestling, so Gotch said. He will now teach you **Scientific Wrestling—Physical Culture—Jiu-Jitsu—Self Defense.** Every man and boy in America, no difference what age, **needs** this wonderful course of lessons. Write today—your **name, age** and **address** on a postcard or letter brings you **our fine book absolutely free,** if you send 4c in stamps to help pay postage—no obligation of any kind. A splendid book on wrestling and physical culture. Write today stating your age.

Farmer Burns School of Wrestling A119 Ramge Bldg., Omaha

This Wrestling Book FREE

This 5-volume Cyclopedia of Carpentry and Contracting is the very latest — most complete—most practical work of its kind ever published. It covers everything you need to know about carpentry and the contracting business—it explains every problem, great or small—every modern approved method gathered from hundreds of different sources.

Carpentry and Contracting

5 volumes, each 5 1-2 x 8 1-4 inches; bound in American Morocco; flexible handy style; 2138 pages and more than 400 illustrations, plans, blue prints and diagrams.

FREE Consulting Service

With these books goes free of all charge a $12.00 Consulting Membership. If any question puzzles you—write us. Our corps of experts and engineers will solve any problem. Ask all the questions you want for a whole year. This service is absolutely FREE.

The combined work of 25 well known men, each an expert in his own particular field, is what this cyclopedia gives you. Every detail of construction is discussed thoroughly from the beginning of the plans to the finished building—from humble cottages to the large modern fire-proof structures.

No man engaged as a carpenter or interested in the building and contracting business can afford to do without these books. They will create a new earning power in you and in every man from the carpenter's helper to the head of the business. Every chapter will give you a world of valuable information that you could get only with years of experience before. Besides this, a year's consulting service in the American Technical Society is yours FREE.

Shipped Free Don't take our word for it that these books will make more money for you. Find out for yourself without any expense or obligation by sending us the coupon on the corner of this page (with the *three* lines filled in) *today*. This will bring all five volumes to you at once; you pay the small express costs and use them as if they were your own for 7 days. Then if you think you want to get along without the advancement they will bring you, send them back at our expense. If you do want to keep them, send us only $2.00 as first payment and $2.00 each month until the special introductory price of $17.80 is paid. The regular price is $25.00.

American Technical Society
Dept. CC-119A, Chicago, U. S. A.

This Is Only a Part of What the Books Contain

and every one of these subjects is divided into all of its possible classifications and treated separately in detail. There are 75 pages on **Stair Building** alone, covering 24 different propositions. There are 90 pages on **Blue Print Reading**, giving the latest up-to-the-minute information and instruction for reading all the different types, and an expert analysis of 50 different kinds of Blue Prints. 220 pages are devoted to **Building Superintendence**, divided into 145 different sections.

Carpentry (including everything from the raw timber and tools to the trimming and turning over to the owner); Stair-Building; Steel Square; Plastering and Painting; Mechanical Drawing; Blue Print Reading; Architectural Drawing; Sheet Metal Work; Building Superintendence; Underwriters' Requirements; Heating and Ventilating; Steam and Hot Water Fitting; Sanitary Appliances; Water Supply; Drainage and Venting; Domestic Hot Water Supply; Hardware; Estimating; Contracts and Specifications; Legal Relations; Building Code; General Index and Review Questions and Index to each volume.

Don't Send Money!

This Coupon is all you need.

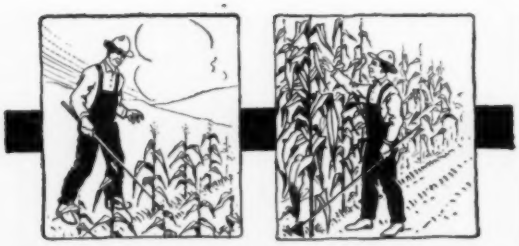
American Technical Society, Chicago
Dept. CC-119A

Please send me the 5-volume Cyclopedia of Carpentry and Contracting, shipping charges collect. I will send you $2 in 7 days and $2 each month until the special price of $17.80 is paid, and you will send me a receipt showing the books are mine. If I decide not to buy I will return the books in 7 days.

Name.....

Address.....

References.....



Right and Wrong Farming Methods

Right and Wrong Methods in Farming

A farmer raised 90 bushels of corn per acre; his neighbor across the road got only 25 bushels per acre. Climate and rainfall were the same. The difference in yield was the result of different methods used in seeding, in preparing the soil, in harvesting. One man adopted the newest and most successful discoveries of farming authorities throughout the country. The unsuccessful farmer depended entirely on his own experience.

—the simplest way to cut down on labor
—the most approved methods of vitalizing your soil
—the soundest principles of improving the dairy herd
—the experts' discoveries for growing record crops
—the practical methods of increasing stock profits
—the most advantageous marketing plans.

Told by More Than 100 of America's Greatest Farming Authorities

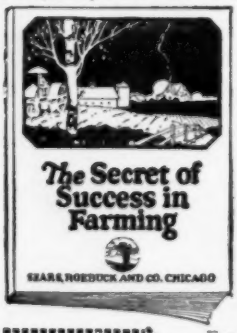
A thousand and one new farming discoveries have been made by men who are revolutionizing crop and livestock results.

These new ideas are quickly reclaiming soils formerly thought hopeless; are securing startling butter fat production; are forcing hogs to market earlier and bigger on less feed; are doubling and trebling farming profits in every climate and locality; are cutting down labor needs by saving work in a hundred ways. *And now these secrets have been made public.*

The Discoveries of Specialists

Just as we have the physician who specializes on one particular branch of medicine, so we have the farmer who specializes on one particular branch of farming. No one farmer can learn through his own experience as much about all branches of farming as all these specialists together have learned. The road to quick success in farming is to take full advantage of what all these authorities have discovered.

A $50,000 Work



At an expense of over $50,000 for the editorial material alone, the successful farming experiences of recognized authorities in all parts of the country have been collected and placed within the covers of Farm Knowledge—the Farmer's Own Cyclopedia. Never before has a work of this scope and value been produced. Farm knowledge contains the results of actual experience in improving methods and increasing profits; it was specially written in interesting and easy-to-understand language. Up to the minute in every way, yet it upholds every old time method that has proved its merit.

FREE Booklet Explains All

Farm Knowledge contains over 2,000 pages in all and over 3,000 illustrations. Each volume is nearly 2 in. thick. It is impossible to describe so important a work here. But we have prepared a special booklet which shows the complete list of contents, names of authors, and sample pages to give you an idea of how the subjects are treated. Every one interested in farming should send for a copy of this free booklet. Write NOW. Mail coupon, postal or letter.

Sears, Roebuck & Co.
Dept. 80P88, Chicago, Ill.

Please send me your free booklet, illustrating and describing Farm Knowledge—the Farmer's Own Cyclopedia.

Name.....

Post Office.....

Street and No. .....

R. F. D. No..... Box No.....

Sears, Roebuck & Co.
Dept. 80P88
Chicago, Ill.

Learn LAW —At Home

The opportunity to get a legal training without leaving your present position is now yours. By our simplified Home Study Course we bring **professors, text books, lectures, cases, personal suggestions, etc.—a complete legal training**—right into your own home, where you can study in your spare time.

Our plan of instruction gives you a complete university training in law. We facilitate your progress by placing you under the direction of the ablest legal minds. The cost of the tuition is moderate and you can pay a little each month if you wish. **Investigate.**

LAW-TRAINED MEN Rule in Business and Public Life

It will pay you to take up law. Lawyers, as a class, enjoy a distinction and prestige unsurpassed in any other profession. There is a vast field open in court practice, in public life and in business. Since every business transaction involves a knowledge of law, the law trained man is always in demand by the great commercial interests. Prepare to profit by these opportunities.

We guarantee that if, after graduation, you do not pass the bar examination we will give you free coaching until you meet the requirements.

14 Volume Law Library Given Free

to students. All branches fully covered. Also Course in public speaking given free to students enrolling now.

Write Now for our free book **"Evidence"** and "Law Catalog", which point the way to a successful career in law. Send for these two books today. They will tell how you can study law at home and all about the opportunities open to you as a law-trained man. Send today.

LaSALLE EXTENSION UNIVERSITY
"The World's Greatest Extension University"
Dept. 664-L Chicago, Ill.

GET ON THE VAUDEVILLE STAGE

I tell you how! **Fascinating profession for either sex.** Big salaries. Experience unnecessary. Splendid engagements always waiting. Opportunity for travel. Theatrical agents and authorities endorse my methods. Thirty years' experience as manager and performer. Illustrated book **"All About Vaudeville"** absolutely **FREE.** Send me your name and address TODAY.

FREDERIC LA DELLE Sta. 182 JACKSON, MICH.

Earn $25 to $100 a Week

Motion Picture, Commercial and Portrait Photographers earn big money. Big opportunities NOW. You can qualify for this fascinating profession.

LEARN PHOTOGRAPHY

Three months' course covers all branches. Experts train you in new, up-to-date studios. Day or evening classes. Easy terms.

Call or write for complete catalog

N.Y. Inst. of Photography Dept. 49 141 W. 36th St., N.Y. City

Oh, You Skinny!

Why stay **thin** as a rail? You don't have to! And you don't have to go through life with a chest that the tailor gives you; with arms of childish strength; with legs you can hardly stand on. And what about that stomach that flinches every time you try a square meal? Are you a pill-feeder?

Do you expect Health and Strength in tabloid form—through pills, potions and other exploited piffle?

You can't do it; It can't be done.

The only way to be well is to build up your body—all of it through nature's methods—not by pampering the stomach. It is not fate that is making you a failure: it's that poor, emaciated body of yours; your half sickness shows plain in your face and the world loves healthy people. So be *healthy—strong—vital.* That's *living.* Don't think too long; send three 2c stamps to cover mailing expenses of my book, "Promotion and Conservation of Health, Strength and Mental Energy," written by the strongest physical culture instructor in the world.

LIONEL STRONGFORT
PHYSICAL AND HEALTH SPECIALIST
954 Strongfort Institute Newark, N. J.

Please Mention Popular Mechanics

GREER COLLEGE OF MOTORING
AUTOMOBILE, TRACTOR AND AIRPLANE ENGINEERING

Here Is *Your* Opportunity to Win Success

By ERWIN GREER

To Ambitious Men Everywhere:

I want to have a plain talk with every reader of Popular Mechanics who is interested in the Automobile, Tractor or Airplane business. I wish especially to talk to the man who is ambitious to "make good" and can see further ahead than the end of his nose.

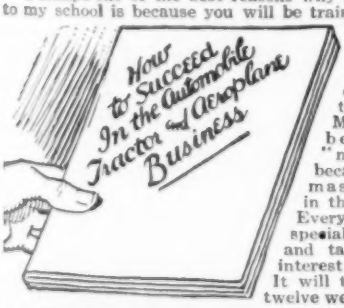
You cannot make a mistake in selecting either the Automobile, Tractor or Airplane business as your life work. There is no other field in which you will find a better future. You want a better job; you want a chance to go into business for yourself a little later on—and there is no reason why you should not succeed in your ambition. Let me give you some interesting facts—

First, you must have specialized knowledge of some kind if you want to get on. Second, you must get the best possible training your ability and means will permit. Your earning power depends on your training. The best pays best in the end.

Over 15 years of my life have been given over to the building up of **Greer College of Motoring** and starting ambitious men on the road to success. These were years of hard work, constant study and planning to make my school the best of its kind. I was never keen on making **Greer College of Motoring** "the largest school in the world"—but I never let anything stand in the way of making it the best.

The Master Method

Perhaps one of the best reasons why you should come to my school is because you will be trained by tried and tested methods—no guess work—no experimenting at the expense of your time and money. My system has been called the "master method" because it makes master mechanics in the shortest time. Every instructor is a specialist in his line, and takes a personal interest in your success. It will take you ten to twelve weeks to complete.



GREER COLLEGE
OF MOTORING
Dept. 16, 1519 Wabash Ave., CHICAGO

EASY FOR YOU TO LEARN

"Learn by doing" is the basic principle of my master method. It's just like going to Manual Training School. It is not necessary for you to have a college education—all you need is plain "horse sense" and the ability to read and write English. You do not need any previous experience of any kind. If you will promise to work hard, I will guarantee that you will succeed.

Here is a list of our courses: Automobiles, Tractors, Airplane Engines, Stationary Gas Engines, Machine Shop Work, Acetylene Welding and Brazing, Vulcanizing, Electric Lighting and Starting Systems, Driving, etc.

ENORMOUS DEMAND FOR TRAINED MEN

As the country is gradually returning to normal conditions, the demand for trained men is increasing by leaps and bounds. If you can "deliver the goods" you can practically pick your job and command your own salary. If you don't want to work for some one else, you will find thousands of splendid locations to go into business for yourself, in all parts of the country. My "personal service department" will help you get started right.

SPECIAL TUITION RATE NOW

Make up your mind to investigate today—right now. You can get a training at the Greer College of Motoring—and remember it's the best school of its kind in the country—at a very moderate cost, if you will come soon. Ask for the special proposition offered for a limited time only.

MY PERSONAL GUARANTEE

I personally guarantee every claim and every promise made by myself or the **Greer College of Motoring.** The cost is low, compared to the value you get at my school, where we have complete and up-to-date equipment—a school with a reputation of unquestioned integrity and responsibility.

You owe it to yourself to investigate—don't delay—**act today.** Yours for Success,

Erwin Greer

P. S. Send for FREE 64-Page Book

I want to send you my free book which will give you full particulars about the wonderful money-making opportunities in the Automobile, Tractor and Aeroplane business. Several pages of **practical information** on Electric Starting Systems, Auto Repairing and Driving, etc. Worth $1 a copy. **YOU cannot afford to be without this book.**

Greer College of Motoring,
Dept. 16, 1519 Wabash Ave., Chicago, Ill.

Please send me free your big book as advertised in June "Popular Mechanics." I am interested in subjects before which I mark X:

[ ] **Automobiles** [ ] **Tractors** [ ] **Aeroplanes** [ ] **Electric Starters**

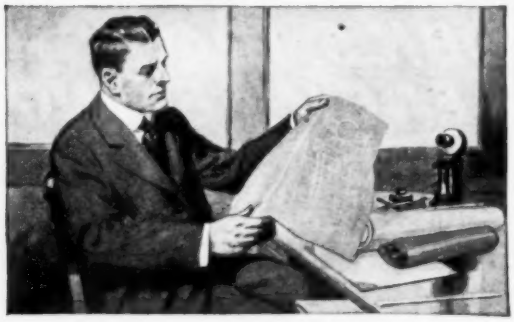
NAME .....

PRESENT OCCUPATION .....

STREET OR R. F. D. .....

CITY ..... STATE .....

Mechanical Engineering



Learn at Home!

THE Government and employers everywhere are looking for men with mechanical ability. Splendid salaries and rapid advancement are offered those with special training.

There is an easy, delightful way in which you can learn right at home in spare time. For 27 years the International Correspondence Schools have been giving men and women just the training they need for success in mechanical engineering and more than 200 other subjects. Hundreds of thousands have stepped into good positions through I. C. S. help, but never were opportunities so great as now.

Let the I. C. S. help *you*. Choose the work you like best in the coupon below, then mark and mail it today. This doesn't obligate you in the least and it will bring you information that will start you on a successful career. This is your chance. Don't let it slip by. The most important thing you have to do is to mark and mail this coupon *now*.

TEAR OUT HERE

INTERNATIONAL CORRESPONDENCE SCHOOLS
BOX 5556 B, SCRANTON, PA.

Explain, without obligating me, how I can qualify for the position, or in the subject, *before* which I mark X.

- ☐ ELECTRICAL ENGINEER
- ☐ Electric Lighting and Railways
- ☐ Electric Wiring
- ☐ Telegraph Engineer
- ☐ Telephone Work
- ☐ MECHANICAL ENGINEER
- ☐ Mechanical Draftsman
- ☐ Machine Shop Practice
- ☐ Toolmaker
- ☐ Gas Engine Operating
- ☐ CIVIL ENGINEER
- ☐ Surveying and Mapping
- ☐ MINE FOREMAN OR ENGINEER
- ☐ STATIONARY ENGINEER
- ☐ Marine Engineer
- ☐ Ship Draftsman
- ☐ ARCHITECT
- ☐ Contractor and Builder
- ☐ Architectural Draftsman
- ☐ Concrete Builder
- ☐ Structural Engineer
- ☐ PLUMBING AND HEATING
- ☐ Sheet Metal Worker
- ☐ Textile Overseer or Supt.
- ☐ CHEMIST
- ☐ SALESMANSHIP
- ☐ ADVERTISING
- ☐ Window Trimmer
- ☐ Show Card Writer
- ☐ Sign Painter
- ☐ Railroad Trainman
- ☐ ILLUSTRATING
- ☐ Cartooning
- ☐ BOOKKEEPER
- ☐ Stenographer and Typist
- ☐ Cert. Public Accountant
- ☐ TRAFFIC MANAGER
- ☐ Railway Accountant
- ☐ Commercial Law
- ☐ GOOD ENGLISH
- ☐ Teacher
- ☐ Common School Subjects
- ☐ Mathematics
- ☐ CIVIL SERVICE
- ☐ Railway Mail Clerk
- ☐ AUTOMOBILE OPERATING
- ☐ Auto Repairing
- ☐ Navigation
- ☐ AGRICULTURE
- ☐ Poultry Raising
- ☐ Spanish
- ☐ French
- ☐ Italian

Name_____

Present Occupation_____

Street and No._____

City_____ State_____

Canadians may send this coupon to International Correspondence Schools, Montreal, Canada

Please Mention Popular Mechanics

GET A NEW SLANT

on the world's news. Don't let kill-joy journalists daub the day's doings all over with gloom. There's a chuckle in it if you know where to look for it.

Cartoons Magazine

finds the chuckle. Its writers, assisted by the world's greatest cartoonists, tell the story of the month's events in a fresh, whimsical way that you can understand. It is not satirical. It is not partisan.

It is DIFFERENT

Cartoons Magazine contains original fun by writers and artists who represent the best American wit and humor of the day.

160 pages each month. Price $3 a year; 25 cents a copy. On sale at all newsstands — or send 25 cents with attached coupon for sample copy.

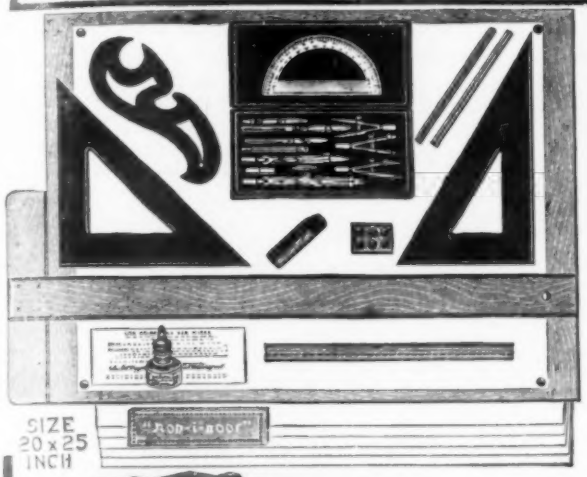
CARTOONS MAGAZINE,
6 N. Michigan Ave., Chicago, Ill.

For 25 cents enclosed, please send sample copy of Cartoons Magazine to the following name and address:

.....

.....

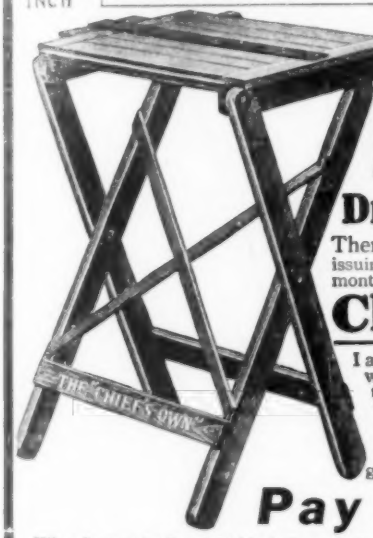
Drawing Outfit and Drawing Table FREE



Complete Set of Drawing Instruments and Drawing Table

Yes, I will give you this complete drawing outfit absolutely free. The instruments are in a handsome high class, plush lined folding case. They are regular draftsman's working instruments. Besides I will give you absolutely free, a 20 x 25 inch drawing board, a 24 inch T square, a 12 inch rule, a supply of drawing paper, two triangles, a French curve, pencils, erasers, thumb tacks, etc.

Delivered at Once



The drawing table is the "Chief's Own" adjustable folding Drawing Table, same as used and needed by first class draftsmen. The complete outfit and table are delivered to you at once. You have them to work with from the very first day.

Be a Draftsman

Draw $175.00 to $250.00 Per Month

There is an urgent demand for skilled draftsmen. Companies are issuing calls every day for men to fill positions paying from $175.00 to $250.00 per month. Work is light, pleasant and profitable.

Chief Draftsman Will Instruct You Personally

I am Chief Draftsman of a large and well known firm. I have been doing the highest paying expert drafting work for a quarter of a century and I know just the kind of training that is demanded from men who get the big salaries. I train you by giving you actual, practical work, the kind that you must be able to do to hold permanent, big paying positions. I give you my individual instruction. If your work is right, I will advance you rapidly. If it is wrong, I will show you where and make you do it right, and do all I can to make you an expert draftsman and designer in a short time. *Write today without fail.*

Pay As You Wish

What I want is the *right kind* of men. Don't bother about expense. I will give you the working outfit free if you get in at once. I charge a very small fee for training you to be an experienced draftsman. You can pay the small cost as suits you best.

Send Coupon for My Big New Book

Put your name and address on the coupon or a letter or a post card and send it to me today. I will send you, absolutely free and postpaid, my new book, "Successful Draftsmanship," and the great special offer that I am now making on which you get the complete Draftsman's Working Outfit and Drawing Table **absolutely free.** You assume no obligations of any kind in sending in the coupon. Get in line for a big paying position. Getting the book and full particulars of the special offer is the first step.

CHIEF DRAFTSMAN DOBE
Engineers Equipment Co., Inc., Div. A119, CHICAGO

Chief Draftsman Dobe
Engineer's Equipment Company
Div. A119 Chicago, Ill.

Without any obligation on me whatsoever, please mail your book, "Successful Draftsmanship," and full particulars of your liberal "Personal Instruction" offer to a few students. It is understood that I am obligated in no way whatever.

NAME.....

ADDRESS.....

.....

Please Mention Popular Mechanics

LEARN AUTOS
WHERE AUTOS ARE MADE

Right NOW is YOUR OPPORTUNITY to get into the GREATEST INDUSTRY the World has ever known

Automobiles—Motor Trucks—Farm Tractors

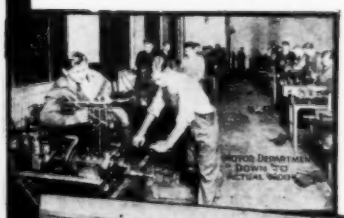
Detroit Trained Men are in demand the world over

Learn in Detroit the center of the industry where Autos, Trucks and Tractors are made. Learn at the School which is backed by Detroit's most prominent men and manufacturers. A school built and equipped at a cost of more than a quarter of a million dollars and operated for the sole purpose of affording ambitious men opportunities to better their positions and win greater success.

You Can Learn Easily and at a Small Expense at the

DETROIT INSTITUTE OF TECHNOLOGY

Practical, common sense methods of instruction—INTENSIFIED by 25 years' experience—over 3,000 enrollments last year.



You don't need any experience! A course in this School will quickly fit you to do well paid work. The need for trained men in the factories and on the farms is acute—*AND THE DEMAND IS INCREASING!*

The Automobile business will continue to grow, the manufacture of Motor Trucks promises to eclipse all records of auto production, *AND THE FARM TRACTOR INDUSTRY IS JUST IN ITS INFANCY.*

TRAINED MEN to build, to sell, to operate, and repair these outputs ARE AND WILL BE NEEDED by the tens of thousands. One Detroit manufacturer alone plans to employ 100,000 men in the building of **Farm Tractors—IT IS ESTIMATED THERE'S A DEMAND FOR ONE MILLION FARM TRACTORS RIGHT TODAY!**

A Thorough Training in the Care and Repair of Farm Tractors Now Included in Our Auto Course

Can you ask for stronger proof of our School's standing than that MEN WHO KNOW give freely of their products, their money and their time to cooperate with us? Among the contributors to our equipment are:—Studebaker, Buick, Hupp, Chalmers, Packard, Hudson, Gray & Davis, Delco, Cutler-Hammer, Zenith, Ford, Port Huron Engine and Thresher, Cleveland Tractor, and many others.

Our big Club House, adjoining our New Building, is at your disposal. Reading rooms, lounging rooms, gymnasium, swimming pool, billiard and pool tables, bowling alleys, with five floors of dormitories and restaurant at low rates. You are assured of not only thorough and competent instruction, but good companionship and clean living conditions with the comforts of home and club life combined. **Don't Visit Detroit Without Seeing Us.** You want to consider everything carefully before you enroll for any course of instruction. Come and look us over, whatever purpose brings you to Detroit. Get all the particulars of this school, get the records of our instructors, hear what auto factories and automobile men have to say about us, see for yourself our comfortable quarters and big equipment. We will be glad to see you and show you around whether you enroll or not. Day and night classes. Start at any time. Write today for full particulars. Address

Educational Director
301 Y. M. C. A. BUILDING, Detroit, Mich.

Courses in Machine Shop Practice Toolmaking

AUTO SCHOOL

SPECIAL OFFER
For a Limited Time Only
Complete Course in the Care and Repair of **FARM GAS TRACTORS** **$60**
Mail the Coupon Today!

DETROIT INSTITUTE OF TECHNOLOGY
301 Y. M. C. A. Building, Detroit, Mich.
Please send catalog and details of your Special Offer. It is understood that this does not obligate me in any way.
Send details of Auto Course.

Signed .....
Address .....
Date .....

Please Mention Popular Mechanics

How An $18-a-Week Clerk Became a $150-a-Week Salesman

The Experience of a Man Who is Now Earning More Every Day Than He Formerly Made in a Week

By Lester E. Smith

NOT very long ago, D. F. H., of New London, Conn., was earning only $18 a week, with little prospects of getting more.

He was dissatisfied and discouraged—tired of dubbing along at wages that allowed only a dull and drab existence, with none of the real pleasures of life.

Finally he decided to make a change. Within just a few months, although he had never had any experience, he stepped into a new job that paid him $600 a month—**more per day than he had formerly made in a week.**

In addition, his new work is absorbingly interesting. He is constantly meeting new people, constantly visiting new towns and cities, and seeing new sights. He travels on the best trains, stops at the best hotels, eats at the best restaurants.

What was the secret of D. F. H.'s quick rise? How did he jump from a poor job into a good one—and in an entirely new line—without having to work his way up through the slow process of experience?

D. F. H.'s Simple Secret

The explanation is simple. There was no luck about it. The first thing D. F. H. did was to get a line on the possibilities in different kinds of work. And it didn't take him long to discover for himself that men who know how to *sell* are the ones who are making the most money, getting ahead the fastest, and getting the most out of life.

The basis of all profit in business is *sales*—the man who brings in the orders is always liberally paid, because orders mean *profits*. **That is why salesmen earn all the way from $2,000 to $10,000 a year and expenses**—many of them more. And that is why salesmen are so often selected for partnership and executive positions—they are the *profit producers*—the *life-blood* of business.

But how was D. F. H. to get his start? He soon found that lack of experience was no obstacle. About that time, he happened to hear of the National Salesmen's Training Association—an organization of top-notch salesmen that in the last twelve years has trained thousands of men for high-salaried positions through spare time study at home. He found that instead of having to start out "green" at a small salary and learn through the hard knocks of experience, he could learn salesmanship from A to Z from a few simple and easy lessons, and start at a good salary. He also found that he wouldn't have to give up his job as clerk until he secured a position as a traveling salesman—and that through its Employment Bureau, The National Salesmen's Training Association was ready to assist him in his choice of positions **without any charge.**

Outselling Veteran Salesmen

Thus in a few weeks of easy and fascinating spare time study, D. F. H. learned secrets of selling that many veteran salesmen *never* discover, even after a lifetime of experience. Through the simple lessons sent him by the N. S. T. A., he got the coaching of men who have been "through the mill"—men who have sold millions of dollars' worth of goods. Through their help, he was able to start in where many salesmen leave off.

And the big point about D. F. H.'s experience (his full name and address will be furnished on request) is that it is a typical example of the way thousands of men—clerks, bookkeepers, printers, mechanics, farm boys, and others—have been able to change from poorly paid work to highly paid positions as salesmen without any previous experience. It is *knowledge* that counts, not experience. For example, G. W. K. had never made more than $60 a month before taking the N. S. T. A. course. In a recent letter he writes: "Last week I cleared $300, and this week $210." Another man writes: "Why should any man work for $25 a week when he can make that much in one day? I made $300 last week and am doing fine."

"Salesmen get the largest salaries because they are the ones who bring in the orders—dividends depend upon their ability."

Free Book Shows Just How They Did It

What these men have done you can do. You don't need to know the first thing about selling to begin—the N. S. T. A. trains you from the ground up—in your spare time, without giving up your present position until you are ready to start out selling—**and then through its Employment Bureau you can secure a good position.**

If you are ambitious to earn more money, to see the world, to get more out of life, then at least investigate—it will cost you nothing to find out how this Association can help you. Simply send your name for interesting free book—it shows why salesmenship offers such wonderful opportunities—**why the demand for salesmen is always ahead of the supply**—explains just how we qualify you for any line of selling—tells about our Employment Bureau and the **many good positions now open.** Includes letters from hundreds of men we have trained. Send for the book today, then judge for yourself. Mail the coupon or just write on a postal card.

Address—National Salesmen's Training Association, Dept. 12-G, Chicago, Ill., U. S. A.

National Salesmen's Training Association
Dept. 12-G, Chicago, Ill., U. S. A.

Please send me your Big Free Illustrated Book and list of lines in which positions are open. No obligation on my part.

NAME .....

STREET .....

CITY ..... STATE .....

Learn Electricity

IN 3½ MONTHS

Thousands of Electrical experts are needed to help rebuild the world. Come to Chicago to the great shops of Coyne and let us train you quickly by our sure, practical way, backed by 20 years of success. The greatest period of electrical construction in history is here. Get your training now as hundreds of our successful graduates have already done—And make big money.

Earn $125 to $300 per month

Hundreds of young men come from all parts of this country and many foreign countries each year to be trained in our big shops. Hundreds enter our day school. Hundreds work in the day time and enter our evening school.

Remember, we use no books, have no classes and do not teach by correspondence. You do the actual work here the same as you will later do on the outside only under expert instructors. From the simplest door bell to the mighty generator—motor—electric locomotive, everything is made simple—understandable. Light—power—heat are masteredeasily—quickly—surely. And all at small expense.

Write NOW for Big Book!

Let us send you this book at once. Read how we train our students, read the letters of our graduates. We gladly send you this book without cost, so fill in coupon, mail it **now.**

Earn Your Way

We maintain an employment dep't to assist those of our students who find it necessary to earn a part or all of their expenses to get positions. There is no extra charge for this service. This dep't also places students in good paying positions after graduating.

Live Like a Prince

Our out-of-town students are placed in comfortable homes in the best section of Chicago—on the lake, at a very moderate price and within a few minutes' walk of the school.

Attend either day or evening classes. The tuition is low with easy payments if desired.

Become an Expert in 3½ Months

No need of taking from 1 to 4 years to become an expert. We have proved this in thousands of cases. The Coyne method of practical training eliminates all books, useless theory and other non-essentials and trains you in just what you need to know to become an expert.

LEARN DRAFTING

The country is crying for skilled draftsmen in all lines. Thousands of positions open with princely salaries. We have been able to place every graduate in a good position. One firm asked for all our men. Now is the time to get into this big field.

ELECTRICITY, DRAFTING, MOTION PICTURE OPERATING, PLUMBING, BRICKLAYING

We teach these trades and professions quickly by practical instructions. Thousands of successful graduates. A big field for you in all these lines.

Coyne Trade and Engineering Schools
Dept. 16, 39-51 East Illinois Street, Chicago, Ill.

B. W. Cooke, Director, Coyne Trade and Engineering Schools
Dept. 16, 39-51 East Illinois St., CHICAGO
Please send at once your big Free Book of Opportunity, I am interested in— [ ] Electricity [ ] Drafting [ ] Plumbing [ ] Bricklaying [ ] Motion Picture Operating

Name .....
Address .....
Town .....
State .....

MAIL THIS COUPON NOW!

Please Mention Popular Mechanics

CLASSIFIED ADVERTISEMENTS

WORLD'S BEST WANT AD MEDIUM

We have records to prove that a classified ad in these columns will find a buyer for almost anything which can be sold. Doubtless you have some article of value to some one else which you no longer need. Why not turn it into money?

Advertisements in this section, 18 cents per word, each insertion, minimum 10 words, payable in advance. To be inserted under proper classification in the July issue, copy should be in our office May 25th.

Popular Mechanics Magazine, Chicago, Ill

Gentlemen: We received over 100 replies to our little ad. and results really surprised us, as we were not aware that your circulation covered so much territory. Replies came in from all parts of the U. S. and Canada, and through this ad we have secured a connection in China and Cuba. Yours very truly,

LEWIS F. OSTRANDER COMPANY.
(Signed) L. F. Ostrander.

AUTOMOBILE SUPPLIES

LIBERTY Plane, Radiator ornament, hand painted aluminum. Any car $1.00. It's simply great. See page 150, Defender Auto Lock Co., Detroit, Mich.

AUTOMOBILE parts for most any make and model car. We save you 10 to 90% of the original cost. Here is a partial list of cars we can supply parts for: Buick, Brush, Case, Chalmers, Chandler, Chevrolet, Cadillac, Carnation, Detroiter, Dodge, E. M. F., Flanders, Ford, Hudson, Hupmobile, International truck, Interstate, Jackson, King, Krit, Little, Marmon, Metz, Maxwell, Michigan, Mitchell, Moon, Oakland, Overland, Ohio, Paige, Rambler, R. C. H., Regal, Reo, Studard-Dayton and Studebaker. Bosch, Splitdorf and Remy magnetos. High-tension magnetos for Ford, Maxwell, etc., K. W. high-tension magnetos, with impulse starter for tractors. Storage batteries, tires, tubes, complete engines, rear axle parts, radiators, Prest-O-Lite tanks and automobiles. We ship orders to all parts of the world. Everything sold with a money back guarantee. You are the judge. Auto Tire & Parts Co., 217 Broadway, Cape Girardeau, Mo.

LUBRICANT Carbon Remover takes the knock out of the Motor. Lubricates the motor, and a guarantee with every can to take out the Carbon, or money refunded, harmless to use, easy to start. Every can is more than paid for itself in more mileage per gallon of gasoline. $1.00 per can. Agents wanted. Paul Vandenberg, 6 East 11th Place, Chicago.

TIRES—Double Tread. Guaranteed for good service. Big—strong. 30x3 tires, $6.25; 30x3½, $7.75; 32x3½, $8.75; 33x4, $10.25; 34x4, $10.75; 35x4½, $12; 36x4½, $13.25; 37x4, $14.50. Big saving on other sizes and tubes also. Trade in your old tires. Discount to dealers. 10% deposit required on C. O. D. orders. Send for list now. Max Liben & Co., 205B West 48th St., New York.

DOUBLE Service Tires. Guaranteed to give good service. Size 30x3, $5.50; 30x3½, $6.00; 32x4, $9.00; 34x4, $9.00; 36x4, $9.00; 36x4½, $10.00; 36x5, $11.00; 37x5, $11.00. Non-skid $1.00 extra. 20% required on all C. O. D. orders. State if Q. D. straight side or clincher type. 5% discount if cash accompanies order. Also special discount to dealers. I also carry a full line of New First and Factory blemished tires and tubes at $9.00 and upwards, tubes at $1.50 and upwards. Prices will be sent on request. Kindly state size. I. Jaffess, 1749 5th Ave., New York. Branch, 241 West 59th St., New York.

DOES your car show that it belongs to you? Beautiful transfer letters, easily applied to your car. Six letters with needs to apply 50c. F. R. Britt, Box 192, Fairmont, W. Va.

VULCANIZE on Anderson's Famous Vulcanizer. See advertisement, page 149.

TIRES—3,500 mile guarantee. There is no tire on the market to equal the Kimball Cord Type Tire at the ridiculous price we quote. See display ad page 153. Kimball Tire & Rubber Co., Inc., 2204-MP, Michigan Ave., Chicago.

STARTER Steel Ring Gears for fly wheels. Starter Steel Ring Gears for fly wheels. Starter Steel Ring Gears for fly wheels. Kent Auto-Parts Co., Denver, Colo.

BUILD a small car; we supply all parts ready to assemble. See our advertisement page 153. Tribune Engineering Company, Owego, N. Y.

HOW to operate and repair automobiles. Book 25c. Devine, M409 W. Division St., Chicago.

STRONG Double Tread Tires; Guaranteed for 3500 Miles; Standard Guarantee. Reconstructed by our wonderful process. Reliner free with each tire: 30x3, $5.50; 30x3½, $6.50; 31x3½, $6.75; 32x3½, $7.00; 34x3½, $8.00; 31x4, $8.00; 32x4, $8.25; 33x4, $8.50; 34x4, $8.75; 35x4, $9.00; 36x4, $10.00; 38x4½, $10.25; 34x4½, $10.50; 35x4½, $11.00; 36x4½, $11.50; 37x4½, $12.00; 35x5, $12.50; 36x6, $12.75; 37x5, $12.75; 37x4, $13.00. Tires shipped C. O. D. subject to examination. Send $2 deposit, or 5 per cent off when full amount accompanies order. State whether straight sides or clincher rims, non-skid or plain tread. Strong Tire and Rubber Co., 3019 Michigan Ave., Dept. F, Chicago, Ill.

MAKE Big money installing farm lighting plants. Battery charging outfits, supplies. Get our special demonstrating offer and agency plans at once. Acme Engineering Company, Louisville, Ky.

BE economical and save money. Guaranteed good service on double-tread tires size 30x3, $5.00; 30x3½, $6.00; 30x4, $8.00; 30x4½, $9.00; 30x5, $10.00. Non-skid, 50c extra. 10% required on C. O. D. orders. State if Q. D., straight side or clincher type. 5% discount cash accompanies order. Special discount to dealers. Economical Tire Co., 611 Bergen Ave., N. Y. City.

INDIVIDUAL wind shield for automobiles. Ernest Schubert, Vliets, Kans.

HYDRONIZER — Insures clean plugs, consumes carbon, saves gasoline and repairs. Money-back guarantee. For all cars. Fords do 34 miles to gallon. Attractive proposition for agents. Free Literature. Friestedt Manufacturing Company, 2932 West Lake Street, Chicago.

STANLEY Steamer Owners get list! Used boilers, burners, engines, automatics, gauges, every imaginable fitting. Reduced prices. Inclose stamp. "Doc" Paine, Denver, Colorado.

AUTONAMEL—Paint your own car for $5; Autonamel goes on over old paint; use car next day; 9 colors; free booklet. Auto-Namel Co., Rochester, N. Y.

MECHANICS—Don't scrape babbitt bearings! Use Smooth-in Babbitt Bearing Compound. Pound box $1.00 prepaid. Compound Co., Box 613, Upland, Calif.

ILLINOIS Oil Company purchased "Gldz" four years ago for resale in their filling stations; we still receive their requisitions, because "Gldz" increases power, mileage, and eliminates carbon. "Gldz" saves gas and money. One can prepaid. One Dollar. Distributors wanted. "Gldz," Galesburg, Illinois.

TIRES—Factory to You Prices. Exclusive representative wanted each locality to use and sell Mellinger Extra Fly Tires. Guarantee Bond 6,000 Miles. Sample Sections furnished. Mellinger Tire Company, Kansas City, Missouri.

MAGNETOS, generators, starters and motors bought, sold and repaired. Thomas W. Lydon, 321 Pearl Street, Baltimore, Maryland.

AUTO Motors and Supplies. Buick, Hupp, Franklin, Michigan, Everett, Hudson, Chalmers, both water and air-cooled motors $40 each and up. Bosch Magnetos $15 each and up. Presto tanks $5.00. Coils, Carburetors, Head Lamps, Horns, Air Compressors, Generators, Starters. Write for Bargain Bulletin second-hand auto accessories. Johnston, West End, Pittsburgh, Penna.

SPEED bodies, top recoverings. Duplicate parts and Accessories for Fords. Splendid quality, bargain prices. Allied Steel Products Company, Aurora, Illinois.

TIRES at Wholesale—Send for prices on 4,000-mile guaranteed tires and tubes. We have the cheapest, high-grade, long life and reliable tires in the world. Write us before you buy. Overton Tire Company, Oelwein, Iowa.

TIRES ¼ less. Buy direct at manufacturer's price. Guaranteed 5,000 miles. Shipped prepaid on approval. Motorist Agents wanted. Write today. Give size of tires. Walter David Rubber Co., 209 Sweeney Bldg., Kansas City, Mo.

VULCANIZERS! First choice of the expert tire repair man. Big money maker. Willey's universal vulcanizing machine. Trade taught free with each machine. Write for literature. Chas. A. Willey, Battle Creek, Mich.

AUTOMOBILE Repairing Made Easy—The most needed and useful book on automobiles ever written. Only book of its kind. Covers every phase of automobile repairing practice. 1,056 pages (5½x8 in.). 1,000 engravings. Cloth. Price $3.50 postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

VULCANIZER for shop use. Vanderpool's. Springfield, Ohio.

BATTERY Charging pays big Profits. City current or gas engine operates. Easy terms. Hobarts, Troy, Ohio.

VULCANIZING auto tires growing and profitable business, especially now. Easy to learn. Instruction book, $1. Plants, $50 up. Catalog free. Equipment Co., 300 8th St., Cincinnati, O.

BELOW factory prices. Black ribbed cord type tires. 5,000 mile guarantee. Best quality. Cheapest on earth. Write for prices or exclusive agency before buying. Greatest opportunity. Don't delay. Co-operative Tire Supply Company, 323 East 33rd Street, Chicago, U. S. A.

AUTO Top Roof or Seat Covers. $7 and up. Parcel post prepaid. Easy to apply. Samples of cloth free. Auto Equipment Co., 330 8th St., Cincinnati, O.

INSYDE Tyres, inner armor for Automobile tires, double mileage and prevent punctures and blowouts. Quickly applied. Cost little. Demand tremendous. Profits unlimited. Details free. American Automobile Accessories Co., Dept. P2, Cincinnati, O.

TIRES—Send for our price list of fine Guaranteed tires. American Tire Co., Oelwein, Iowa.

GRAPHITE for Automobiles, Farm or Shop Machinery lubrication. Big money saving proposition. Learn about our prepaid shipments. Five pound can powdered Graphite shipped direct from factory to you parcel post for $1. Guaranteed quality or money back. Write for free sample and booklet. "Reasons Why You Should Use Graphite Lubrication." Ajax Carbon Refining Co., 3033 Doyle Place, Chicago.

AUTOMOBILE repair shop. Something new. A repair shop necessity. A device that you have long been waiting for. Saves your time and makes you money. Nothing like it on the market. Send for booklet. Fesco Manufacturing Company, Sutherlin, Oregon.

STORAGE Batteries guaranteed one year. 6 volt, $23.50. 12 volt, $27.50. Mention make and model of car when ordering. Batteries shipped C. O. D. upon receipt of $2.00 or old battery. We build batteries to order and save you 50%. Storage Battery Service Co., Muncie, Ind.

AUTOMOBILES

"LEWIS" Six-cylinder six-passenger touring car. Plenty speed and power. Electric lights and starter. Condition guaranteed. Charles G. Pape, Fort Wayne, Ind.

INVENTORS—Send sketch of your invention for advice regarding patent protection. Twenty years' experience. Handbook on Patents sent free. Talbert & Talbert, Patent Lawyers, 4657 Talbert Bldg., Washington, D. C.

FOR Sale—Smith Flyer, Juvenile Auto, in good condition; $65.00. Chas. Koehring, Indianapolis, Indiana.

PATENTS—Write for our free illustrated Guide Book, "How to Obtain a Patent." Send model or sketch and description of your invention and we will give our opinion of its patentable nature. Highest references. Prompt service. Reasonable terms. Victor J. Evans & Co., 185 Ninth, Washington, D. C.

DETROIT-VAPOR carburetors eliminate carbon, uses all fuel readily, increases motor efficiency 65%. Fords do 40 miles on gallon. Fits all cars. Money-back guarantee. Ford—or inch sample $7.50. Responsible representatives wanted. Holmes Motor Products, Box 213, Detroit, Michigan.

CYLINDERS reground, new pistons and rings fitted. Restores lost power. Write for prices, giving make and model. The Evarts Machine Co., Hartford, Conn.

AUTOMOBILE Repairman's Helper—This new 400 page book shows the best methods to use in handling any automobile repair job. 316 illustrations. Convenient pocket size. Flexible leather cover. Price, $2.50 postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

MODERN Starting, Lighting and Ignition Systems—A new book on automobile electricity without an equal. Nearly 400 Pages. 250 Engravings. Cloth. Price, $2.00 postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

GET into the Automobile business, as salesman, chauffeur, garage manager, mechanic. Automobile instruction in four weeks' residence course. Send for booklet P. M., West Side Y. M. C. A., Auto School, 318 West 57th St., New York.

INSYDE Tyres, inner armor for Automobile tires, double mileage and prevent punctures and blowouts. Quickly applied. Cost little. Demand tremendous. Profits unlimited. Details free. American Automobile Accessories Co., Dept. P-7, Cincinnati, O.

TO FORD OWNERS

FORD Owners. Sell our high grade guaranteed tires. We advertise in your section, turn all orders and inquiries over to you. Sales easy. Big demand. $100 to $300 monthly. Old established company. Reference, National bank, City. Write now. Service Tire & Rubber Co., Pocomoke City, Maryland.

SAVE gasolene, a real fuel mixer; impossible for air and gasolene to get thru without being thoroughly mixed, increases mileage and power, attach in 5 minutes, no holes to drill or changes to make. $2.50 by mail. Money back if not satisfied. Ureka Sales Co., Chattanooga, Tenn.

LIGHT Booster, Good lights at all speeds, if one goes out the other burns, one minute to install. $1.50. Money back if not pleased. Ureka Sales Co., Chattanooga, Tennessee.

FORD tourists' bed $7.50! Circular free. Auto-Sleeper, 1221L, Sacramento, Cal.

DEMOUNTABLE Wheel sets, $5.50. Agents' proposition. Kable, West End, Pittsburgh.

"STEER-AUTOMAT" — Only practical Ford steering aid. Prevents accidents. Keeps car on straight course through sand, mud, ruts. Protects the lady driver. Order today—enjoy complete steering satisfaction. $4.25 C. O. D. We pay postage. Steerautomat Company, Not Inc., Box 262, Rockford, Illinois.

FORD Owners, attention. Protect your cars from theft with a Defiance Lock. Price one dollar. Send for it today. Ford Lock, Twenty-seven School St., Boston, Massachusetts.

HERE it is. Up to date valve in head motor of your Ford. Our specially designed head, eight valves directly over pistons, increases power fifty per cent. Greatest economy. Mr. Truck Owner reduce your operating costs. Also head for speed. Price $50.00. Culford Engineering Works, 17 Sproat St., Detroit, Michigan.

POWER of the Ford doubled through leverage. The greatest satisfaction to climb hills, pull through mud without using Ford Low. Victor "4 Speeds Forward" Auxiliary Transmission is mechanically simple, easily attached. Among 7 vital advantages provides the missing "2nd" or "Intermediate" speed. Owners, Agents, why not learn the facts? Write now for complete line of "Power-4-Ford" devices to increase Power, Ability, Economy and Speed of Ford Cars and Trucks. Convincing Trial Plan B. Victor-Ford Transmission Manufacturers, 248-250 West 54th, New York.

FORD Gray-Davis electric starter, generator complete, less battery, perfect, $25.00. 8039 Parnell, Chicago.

MAKE Big Money installing farm lighting plants. Battery charging outfits, supplies. Get our special demonstrating offer and agency plans at once. Acme Engineering Company, Louisville, Ky.

FARM with your Ford. Make it a tractor and a power plant. Circular free. Agents wanted. Geneva Tractor Company, Dept. P, Geneva, Ohio.

200% MORE Light. Sell the famous 4-A Dimmer Equalizer. Big profits. Money-back guarantee. 4-A Products Mfrs., Charles Building, Denver, Colorado.

ACCESSORIES at Cost. Particulars free. Brackbill, 3911 Park Ave., Philadelphia.

FORD Starter $10.00; 30x3½ tires made puncture-proof, 75c. Relax Co., Norwood, Ohio.

DISC Wheels for your Ford. Life-size patterns and instructions furnished. Send 53c to Kuempel Co., Dept. J. K., Guttenberg, Ia.

"IN-TEN-SO" Ford Headlight Regulator Increases Headlights 200 per cent at all engine speeds. Makes night driving safe. Illuminates road 200 ft. ahead—through fog or dust. Easily attached. Operates automatically. 200,000 Satisfied Ford Users. Guaranteed life of car. Money refunded after ten-day trial if not satisfactory. Sent prepaid on receipt of $1.50. Why deliberately risk your life with unsafe Headlights? Order "In-Ten-So" immediately. Continental Auto Supply Co., Davenport, Iowa. (Attractive Proposition for Live Agents.)

PREPAID for $1—One wire assembly (5 Wires), four spark plug wires, one pair Tungsten Vibrator Coil Points. Unsco, Box 253, White Plains, N. Y.

SUNLIGHT for Fords. Bright light all speeds, and dimmer. Guaranteed. Big profit for you. Sunlight System Co., 1503-10 Lytton Bldg., Chicago, Ill.

THOUSANDS of Bul-zi Nuts hold horn buttons at center of steering wheel. 25c postpaid. Bul-zi Nut Co., Sunnyslope Station, Kansas City, Mo.

A HANDY Pocket in the door of your car. Wonderful convenience for Ford owners. Our complete outfit enables you to install them yourself. Send for free trial offer. Detroit Auto Door Pocket Co., 37 Harrison Ave., Detroit, Mich.

MAKE Your Ford a Super-Ford! Sensational invention! Ford owner reports 100% mileage increase! Ford runs like twin six. Prevents carbon. Money-back guarantee. Booklet. Agents wanted. Gasoline Economy Company, Dept. O, Colonial Trust Building, Philadelphia.

FORDOWNERS are discarding all light devices for "Slow Speed Bright Lights." Retail $1.00. 300% profit. Guy Cox, Golden, Ill.

300-PAGE book on the Ford car for every Ford owner, dealer and repairman. Deals fully with construction, operation and repair. 100 engravings. Best and most complete Ford book published. Price, $1.00 postpaid. Also Ford Engine Chart, 25x38 in. Location of engine trouble made easy. Price, 25 cents postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

FORD Car Repair Book sent free. This complete, well illustrated, valuable book explains in a simple way the Causes and Cures of Overheating; Repairing Ford Timer; Curing Piston Ring Troubles; Carburetor Adjustments and Repairs; Connecting Rods; Transmission Troubles; Care and Repair of Rear Axle; Stopping Axle Grease Leaks; also covers practically every other phase of Ford Car repairing. Another feature is a chart showing exactly how much to pay for work done by repair men. Send 25c coin for three months' trial subscription and get the valuable repair book free. Ford Owners' Magazine, 456 Montgomery Bldg., Milwaukee, Wisconsin.

"THE Litl Shofur" saftey steering device for Ford Cars, operates without coiled springs, bearings, cams, or other wearing parts. Thousands sold and only $3 each. Agents wanted everywhere. Powel Crosley, Jr., Sta. A, Cincinnati, Ohio.

INSYDE Tyres, inner armor for Automobile tires, double mileage and prevent punctures and blowouts. Quickly applied. Cost little. Demand tremendous. Profits unlimited. Details free. American Automobile Accessories Co., Dept. P-8, Cincinnati, O.

MOTORCYCLES, BICYCLES & SUPPLIES

MOTORCYCLES—Bargains in overhauled slightly used machines. Twin Excelsior, Indians, Harley-Davidsons, $50 and up. Write us kind of motorcycle you need. Jensen 75th Street, Euclid Ave., Chicago, Ill.

WE sell motorcycle parts for Henderson, Harley, Excelsior, Indian, Flying Merkel, Dayton. Also Clutch, Carburetor and Magneto parts. Reasonable prices. Mail orders filled promptly. Ask for our list of used motorcycles. Haverford Cycle Company, 89 Gratiot Avenue, Detroit, Mich.

MOTORCYCLES all makes $25.00 up. New bicycles at big reduction. Second hand $8.00 up. Motors, motor attachments, Cycle motors, Smith motor wheels, etc., $20.00 up. New parts to fit all makes carried in stock. Second hand parts good as new 50% discount. Expert repairing on magnetos, generators, transmissions. Motors overhauled $10.00 up. Henderson motors our specialty. Write for big bargain bulletin. American Motor Cycle Company, Dept. 3, Chicago.

BARGAINS in used Harley, Excelsior, Henderson and Indian motorcycles, $40.00 to $250.00; new and used bicycles, $18.00 to $60.00; condition guaranteed. Write for bulletin. Chas. A. Merkel, 162 Clinton Ave., North, Rochester, New York.

NEW Side Cars fit any Motorcycle $60.00. Herman Kaskel, Spencerville, O.

NEW and second hand motorcycles at bargain prices. Write for agency proposition. Eagle Motorcycle Co., 700d Center St., Brockton, Mass.

DON'T buy that bicycle until you get a free Liberty Bell Catalog; something new. 1008 & 10 East 15 St., Kansas City, Mo.

BICYCLES $7.50 up. Tandems (bicycles built for two) $15 up. List free. McDougald, 300 N. Wells, Chicago.

I SAVE You half on parts and accessories for all makes. State model for Circular 22. Jones, the Parts Man, Box 69a, Brockton, Mass.

FOR Sale—Several Indian Motorcycles thoroughly overhauled and in first class running condition. Glenn A. Scott, Marion, Indiana.

USED Motorcycle Buyers. Attention—We can save you from $35 to $50 on any motorcycle you purchase of us. 100 late model Machines, all makes, $25 up. Write for catalog. Myerow Bros., 258 Columbus Ave., Boston, Mass.

100 USED Indian, Harley-Davidson, Henderson, Excelsior Motorcycles and sidecars; all makes of new and used parts 50% off. Repairing, Exchanging Supplies. Write us. Stern Bros., 1519 Second Ave., N. Y.

BIG bargains in second-hand motorcycles, $25 up. Indians, Harleys, Thors, Excelsiors, and Merkles. Write for description. Howard A. French & Co., Baltimore, Md.

MOTORCYCLES—Buy now while prices are low; large stock on hand. Harleys, Indians, Excelsiors, Hendersons, Popes, Reading-Standards, and others. Tires and tubes at big reductions; state size wanted. Machines all overhauled and guaranteed running condition. Illustrated Catalogue 5. Carl W. Bush Co., Newark, N. J.

MOTORCYCLES, Side Cars and Cyclecars. Their Construction, Management and Repair—The only complete work published on this subject. The dealer, mechanic and rider will find this an excellent treatise. 550 pages, cloth, 350 illus. Price, $2.00. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

WE pay cash for second-hand motorcycles. Send description and lowest price. Harry R. Geer Co., 888 McLaren Ave., St. Louis, Mo.

MOTORCYCLE cylinders reground, fitted with new piston and rings, $5.50, guaranteed. Muncie Piston Co., Muncie, Ind.

WANTED: We pay cash for used motorcycles or take them in on exchange for new machines. Write with complete description. State condition of tires, frame, motor, make and model. Shaw Manufacturing Co., Dept. 137, Galesburg, Kans.

BIG bargains in good motorcycles we have taken in exchange on new ones. Send for special bargain list. Shaw Mfg. Co., Galesburg, Kansas.

DON'T buy a Bicycle Motor Attachment until you get our catalogue and prices. Shaw Mfg. Co., Dept. 27, Galesburg, Kans.

FOR Sale—All makes second-hand machines. Also second-hand parts. Overhauling, reboring, remodeling. Write for prices. F. J. Mahowald Co., 626 N. Front St., Mankato, Minn. Largest motorcycle garage in Minnesota.

LARGE stock of rebuilt motorcycles, new parts for all makes 25% discount; second-hand parts, good as new, 50% discount. Motorcycle Parts Mfg. Co., Chicago.

WELDING

WELDING Plants $30.00 to $300.00. Designed for all purposes, small cash payment, balance three to six months. Every mechanic or shop should have one. Write Dermo Co., Omaha, U. S. A.

OXY-ACETYLENE Welding and Cutting, Electric and Thermit Welding. Brand new book of practical instruction in this process. The workman will find all necessary information for handling any kind of welding. 215 pages, fully illus. Cloth, $1.00; Leather, $1.50 postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

SIMPLE Soldering, both hard and soft—8 page book, telling how to join metals. Do your own repairing. 52 illustrations. 25c postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

DON'T Scrap Aluminium Parts. Save them with So-Luminum. New, great "3 in 1" welding, brazing and soldering compound, stronger than aluminum—perfect substitute for acetylene welding— ¼ time and cost. Use gasoline torch or soldering iron. No flux. Booklet 12. Sample bar $1.00. $2.50 per lb. Used by United States Army and Navy, indorsed by British Munitions Board. So-Luminum Manufacturing Company, 1790 Broadway, New York.

THE Vulcanizer for shop use. Save 25% Equipment Co., 396 8th St., Cincinnati, O.

AVIATION

INVENTORS—Send sketch of your invention for advice regarding patent protection. Twenty years' experience. Handbook on Patents sent Free. Talbert & Talbert Patent Lawyers, 4659 Talbert Bldg., Washington, D. C.

AIRPLANES — For Sale: Royal Flying Corps Canadian training planes, equipped with Curtiss 90 h.-p. Ox 5 engines; first-class flying condition; immediate delivery; $2,000 each; complete supply service. United Aircraft Engineering Corporation, Room 1201, 52 Vanderbilt Ave., New York City.

INVENTORS desiring patents should write for our Free illustrated Guide Book, "How to Obtain a Patent." Send model or sketch for our opinion of its patentable nature. Highest references. Prompt service. Reasonable terms. Victor J. Evans & Co., 187 Ninth, Washington, D. C.

AIRPLANES built to order. Supplies Furnished. Send 10c for illustrated catalogue. You can build Bleriot Monoplane from our scale and full-size working drawings. Price $10. American Aeroplane Supply House, Hempstead, New York. Established 1910.

FOR Sale at a bargain: 2 slightly used Aviation Motors, 30 and 20 H. P. Write for description and price. Lock Box 473, Harlan, Iowa.

FOR Sale, Flying Boat; also Hall Scott motor. Reasonable offer takes both. Box 624, Monticello, Iowa.

FOR everything aeronautical, write the Heath Airplane Co., Chicago, Ills.

SMALL Aeroplane Motors, $60.00 complete. Send 20c for blue print. T. A. Eberhardt, 1138 Wall St., Milwaukee, Wis.

FOR Sale, 8 cylinder, 120 h.p. Maximotor, $500. Set of double covered planes and pontoon for hydro, $200. J. E. Odell, Waterloo, Iowa.

BUILD your own aeroplane, on installments. A. Angeles, East Seattle, Wash.

BUILD that airplane. We furnish the plans and material for $96.50. Use your motorcycle motor and wheels. Stamp for particulars. Blaski, 2036 N. Robey, Chicago.

AEROPLANE flies 2,000 feet—climbs; spirals; controls adjustable Manhattan Racer Experimental Model. 26 inch wing spread. Hundreds in use. Great for outdoor sport. A wonderful practical flying model for men, boys and amateur aeronauts. Blueprints 35c postpaid, or complete materials, including carved propellers, knockdown, ready to assemble and fly, with detailed working instruction, $3.50, postpaid anywhere in U. S. Working blueprints of famous Bleriot Racer, flys 600 feet, 35c postpaid in U. S. HEC Aeroplane Co., 6 West 48th Street, New York, N. Y.

FOR Sale: Tractor Biplane with 50 h.p. Roberts motor. Plane needs minor repairs, but motor is as good as new. First check for $400.00 takes it. Lieutenant Chilstrom, 1621 Division Street, Chicago.

LEARN to Build Airplanes in the Heath Airplane factory. Half price for course this spring. Write for circular now. Heath Airplane Co., Chicago.

PROPELLERS for Air Propulsion, Practice and Professional blades made to order. Crawford Motor and Aeroplane Manufactory, Pittsburgh, Pa., New Orleans, La.

100 MODEL Aeroplanes. Good flyers. 12c Stamps brings price and photo. Write F. Bruland, Royal Oak, Mich.

GET our latest Aeroplane Book containing full information about "Ideal" Model Aeroplanes, parts, plans, etc. 5c postpaid. Ideal Aeroplane Co., 67½ West Houston St., N. Y.

OUR New Aircraft Catalog Free. Chicago Aero Works, River Street.

BOOKS AND PERIODICALS

BOOKS, Books, Books. No matter what you want in the book line I can fill your order. If you cannot find the book you want, send for my big catalogue today. Levi Bryant, 4808 Champlain Ave., Chicago, Ill.

FIVE Vol. People's Encyclopedia. Illustrated, never used. Quick sale $6.00, cost $12.00. E. M. Hubbs, Dexter, N. Y.

KAISER Bill's letter to Otto. One big laugh. With book Catalogue free. Byron, 356 West 119th St., N. Y.

COMPLETE Courses in civil service. Book of 238 pages for $1.25. Starboard Press, Calypso, N. C.

FOR Sale—$75 buys my Patent Medicine Formula Book. (Copyrighted.) Send stamp. George Praechtl, Pine hill, Buffalo, N. Y.

RARE Books. Catalogue free. Technical Books. Descriptive Catalogue now ready. Sovereign Publishers, 160 Sycamore, Buffalo, N. Y.

AMERICAN Guide, Birmingham, Alabama. Keep Posted. Trial Six Months. Quarter Postage.

CANCELLED stamps wanted. Cash paid. Particulars 3c. Elsea, Owosso, Mich.

BOOKS that will help you financially, physically and intellectually. All subjects. Catalog Free. State wants (or subject). Horn, Box 794, Baltimore, Md.

BOOK describing Hun atrocities and their attacks on women and girls in Belgium, 25 cents. Belgian Specialty House, 2806 Union Avenue, Chicago.

100,000 SECOND-HAND books for sale, 25c, costly bindings; some cost $25.00 new; Medicine, Surgery, Agriculture; Mechanical; chemistry, philosophy, encyclopedias, law; scientific; technical; mathematics; history; fiction; religious. Send 10c stamps for catalogues (none free). McCarthy, 1236 Arthur Ave., Chicago.

CATALOG of the Latest and Best Books on Mechanical, Electrical and Industrial Subjects, comprising 128 pages and adequately describing more than 400 works. Sent free upon request by Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

ENGINEERS' questions and answers for license by Hobson, for twenty-five cents, postpaid. Send stamps. Reilly's Book Store, Philadelphia, Pa.

INSTRUCTION Book (for shop use) on Vulcanizing Auto-Tires, $1. Tire Equipment Co., 366 8th St., Cincinnati, O.

THE Schemer, Alliance, O., can help you make more money because it prints many money makers each month; 32 pages; to convince you, will send four months for only 25c; regular price, 10c a copy.

BIG Magazine 3 Months, 3 War photos, Secret Writing Book: dime only. Clever Stories, Rockland, Wisconsin.

PICTURES, POSTCARDS & NOVELTIES

POSTCARDS — Retiring from business; don't miss this opportunity. 100 assorted for 25c; 300 for 50c; 1,000 for $1.00, prepaid. Order immediately. Richard Lavery, Asbury Park, N. J.

EVERYTHING in Postcards. Live wire list sent free. Worth-while samples for 25c. Mention subjects preferred. Mutual Supply Co., Bradford, Pa.

TRUE-BLUE friends everywhere. Exchange postals. Club organized 1908. Book, hundreds listings, 10c. Ed Ericson, 619, Elroy, Wis.

POST-CARDS from Everywhere. Hundreds of satisfied members. Special offer: six months' membership 25c. Join now. Trial membership 10c. Popular Exchange, Windsor, N. C.

POSTCARDS from Everywhere. Join live club. Application papers 10c. Harvey Teeple, Decatur, Ind.

WOULD you like to exchange postcards, stamps, coins (state which), with some of our 18,000 members in many countries? Membership, 15c. Halcyon, Box 133-P, Erie, Pa.

FIVE prettiest women cards, hand colored, 25c. Durso, 25 Mulberry, N. Y. City.

CROSS-SECTIONAL view of ocean liner "Britannic," showing interior arrangement of ship in colors, size 14x20 inches, on heavy plate paper for framing or hanging. Very interesting. Reproduced from front cover design of Popular Mechanics. Will be sent postpaid to any address in the world on receipt of 10 cents in stamps to cover packing and mailing. Popular Mechanics Magazine, 6 N. Michigan Ave., Chicago.

GAMES AND ENTERTAINMENT

VENTRILOQUISM Taught almost anyone at home. Small cost. Send today 3c stamp for particulars and proof. O. A. Smith, Room R-614, 801 Bigelow Street, Peoria, Ill.

250 MAGIC Tricks and catalog, 10c. Clarence L. Maugans, Anderson, Ind.

250 MAGIC Tricks with cards, coins, egg, ring, glass, etc., 10c. The Art of Ventriloquism, 10c. Perfection palming coins 10c, 3 for 25c. Large novelty catalogue included. World Novelty Co., 2204-M, Michigan Ave., Chicago.

CHI-CHI Chinese Fortune Telling, the game with the mysterious bamboo sticks. Oldest known method in world and one most frequently used by Chinese. Sample set 50c, coin or money order. F. L. Morgan Co., Importers Oriental Merchandise, San Francisco.

SCENERY, Flags and novel decorations for hire. Amelia Grain, Philadelphia.

HERE Boys! A toy aeroplane, flies 100 feet; complete fuselage 30 cents, prepaid. Don't send stamps. Nifty Novelty Co., Newark, N. J.

MASTER Mysteries. Real stage secrets. World famous packing box escape. The Death Defying milk can mystery, sensational watertank escape, Burning woman Illusion, World famous High Dive with handcuff escape, Iron Cell escape, The great Mail Bag escape, Glass case escape, Russian torching Board, Siberian Wrist shakle. Price 25c each or all ten postpaid for $1.00. Kams Magic Shop, 314 No. 8th St., Manitowoc, Wis.

X-RAY Card and catalog of magic tricks and jokes for three cent stamp. Michigan Magic Shop, 300 Selden, Detroit, Michigan.

TRICKS, Puzzles, Magical Apparatus, Plays, Stage Supplies, Mind-reading Acts, Sensational Escapes and Illusions. Free, large illustrated 1919 catalogue. Oaks Magical Co., Dept. 548, Oshkosh, Wis.

2 NEW tricks, complete, Lists, All 10c. W. Wooley, Peoria, Ill.

GO on the Stage or motion pictures! Experience unnecessary. Particulars free. Manager, Box 397, Philadelphia, Pa.

CAMO-FLAG—Makes fun and money for Fairs, Entertainments, amazing profits, sample free. George Bridge, Plainfield, N. J.

TRICKS, Puzzles and Novelties. Catalog free. Benj. Zitka, Fairview, Mass.

WONDERFUL Wrist Shackle. Something unfathomable. New principle. Seemingly impossible escape effected instantly. Refund if not satisfactory. Nickeled—75c. 52-page bargain magic catalog 5c. Gilmagico, "P" 11135 South Irving, Chicago.

TICKETS—For plays, entertainments, etc. O. Dickey, Bayonne, N. J.

MAGIC Tricks for pocket, parlor and stage. Largest assortment in the world. Thurston's Book of Pocket Tricks 25c. Book of Card Tricks 25c, postpaid. Send 2c stamp for catalogue. (Large page professional catalogue 25c.) Refunded on first $1 order. A. Felsman, 115 So. State, Chicago.

MAGIC—Illusions and Novelties. Professional catalog 25c. Oldest firm in America. Martinka & Co., 493 Sixth Ave., New York City.

MAGIC—Tricks, Books and Supplies. For Amateurs as well as the great Professionals. Anyone can learn through our instructions. Feature Acts in Mind Reading, Spiritualism, Rope Ties, etc. Large illustrated Professional Catalogue, 10c. Chicago Magic Co., Dept. B, 72 West Adams St., Chicago, Illinois.

BIG Book for Boys—The Boy Mechanic, Vol. II. A sequel to, but containing nothing found in Vol. I. Tells all about 1,000 interesting things to make and do. 480 pages! 995 Illus. Cloth. Price, $2.00, postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

MAGIC-SENSATIONAL Escapes, from Handcuffs, Ropes Jails, etc. Novelties-Jokes. Everything in the amusement line. Largest house of its kind in the world. Big new catalog illustrated. Sent free to your address. Write Heaney Magic Co., Desk B, Berlin, Wisconsin.

STAMP COLLECTING

COLLECTOR sacrificing collection, selling limited number fine foreign stamps. Send $1.00 for 100 different mounted, catalogling over $4.00. Andrew Baldwin, Hermosa Beach, Calif.

TWENTY foreign stamps free. Postage. Multnomah Stamp Company, Portland, Oreg.

10 GREECE, 10 menagerie stamps, 500 hinges, album, and perforating gauge, 25c. Cherry Stamp Co., 5402 Pasadena Ave., Los Angeles, Cal.

"COLLECTORS' Digest," review-index-directory world hobbies, 25c year. Station G, Buffalo.

BEGINNERS—Try our penny approvals. F. L. Church, Tollhouse, Calif.

SNAPS—150 different stamps, 15c. 60 different United States stamps 11c. With each order we give free our price list of sets, packets, albums, etc., and our pamphlet which tells "How to Make a Collection Properly." Queen City Stamp Co., Room 36, 604 Race, Cincinnati, Ohio.

50 DIFFERENT stamps and Civil War scut 13c. Carl Miller, Westernport, Md.

300 DIFFERENT stamps $0.50. Fred Onken, 630 79th Street, Brooklyn, N. Y.

BON-ACCORD 1c approvals all countries. J. W. Taylor, 3122 Westmont St., Philadelphia, Pa.

BEST one cent approvals in America. F. P. Hand, 1117 So. 60th St., Philada, Pa.

CANADA Packet Free — Early Issues, Maple Leaves, War Stamps, send 2c coin. Midland Stamp Company, Midland, Ontario.

SELL Me stamps sold your post office. Ask particulars. H. M. Southgate, Chevy Chase, Maryland.

FOR Sale—3,000 old postage stamps collected about 1870. Wanted—good typewriter. Bruce Martin, Zanesville, Ohio.

50 DIFFERENT South and Central American with approvals, 20c. Excel 939A, Webster Ave., Chicago.

STAMPS! 50 Different Belgium (large bi-color), China, Jamaica, Portugal, Venezuela, etc., 10c; 1,000 well mixed, 40c; 100 varieties U. S., 50c; 1,000 hinges, 10c; Agents wanted, 50%. List free. I buy stamps. L. B. Dover, Overland, Mo.

BARGAINS! 25 different British Colonials, 5c. 25 different Cuba, 15c. 25 different Chile, 20c. Nickles, 122 Florida Ave. Washington, D. C.

158 GENUINE Foreign Stamps—Mexico War Issues, Venezuela, Salvador and India Service, Guatemala, China, etc., only 10c. Finest Approval Sheets 60% to 80%. Agents wanted. Big 72-p. Lists free. We buy stamps. Established 25 yrs. Hussman Stamp Co., Dept. 54, St. Louis, Mo.

BACK from France! Try my approvals. You'll stick. John T. Ackerson, Hackensack, N. J.

100 DIFFERENT stamps 10c; 200, 25c. Approvals. Micheal, 5602 Prairie, Chicago.

FREE—25 different United States with 60% approvals. Enclose 3c. 100 different United States, 25c. Seidenberg, Beecher, Ill.

MEXICO War Stamps—10 diff., free to applicants for approvals. George F. Linn Company, Columbus, Ohio.

STAMPS—12 different from warring nations, 10c; 10 different foreign coins, 15c; 10 Uruguay stamps, 10c. Lists free. Toledo Stamp Co., Toledo, Ohio.

105 CHINA, etc., stamp dictionary, list, 2c. Album (500 illustrations) 3c. Bullard, Sta. A., Boston.

STAMPS, 50 Varieties, Transvaal, Brazil, Peru, Cuba, Mexico, etc., and Album, 10c, 60 different U. S., 25c. 1,000 hinges, 10c. List free. I buy stamps. C. Stegman, 5948 Cote Brilliante, St. Louis, Missouri.

FREE: 35 dandy stamps to applicants for Nifty Approvals. Send 3c for postage. Belmont Stamp Co., 551 N. 52nd Street, Philadelphia.

500 MIXED U. S. old and new 10c. Weatherby, Medina, Ohio.

STAMPS sent on approval at 70% discount. Reference required. Emory Benoli, Hanover, Pa.

75 DIFFERENT Stamps, Free. Postage 3c. Christensen, 1673 3d St., Milwaukee, Wis.

24 VARIETIES Cuban stamps, 10 cents. List of 6,000 low-priced stamps free. Chambers Stamp Co., 111 P. Nassau St., New York City.

FREE — 60 different stamps, including Newfoundland, China, Japan, Mexico, etc., to applicants for our high grade approvals. Send 3c stamp for return postage. The Edgewood Stamp Company, Dept. H, Milford, Conn.

PACKET of 23 stamps: no two countries alike. Packet hinges. Set of $1 and $2 U. S. Rev., all for 5c. Mention paper. Miami Stamp Co., Toledo, Ohio.

STAMPS, 61, all different, free. Postage, 3c. Mention paper. Quaker Stamp Co., Toledo, Ohio.

20 UNUSED stamps free. All different. Postage, 3c. Fisk Stamps, Toledo, Ohio.

60 CHINA, Japan, etc., hinges and album for 480 stamps, 15c. Globe Stamp Co., 2926 Broadway, Los Angeles.

RARE COINS

COINS, 5 curious rare coins with catalog, sent for 10c. H. Hooker, New Berlin, N. Y.

ALASKA Gold, ¼ pinch, 35c; ½ pinch, 70c; one pinch, $1.20. Villa coin and catalog, 10c. Homer Shultz, Union Star, Mo.

OLD Coins Wanted. We pay up to $100 each for certain dates of Gold Dollars. Premiums paid on some coins as late as 1916. Thousands of coins wanted. Many are in circulation. Watch your change and get posted. Send 4c. Get our large illustrated Coin Circular. Send now. Numismatic Bank, Dept. H, Fort Worth, Texas.

COLLECT foreign copper coins, list free. Standard Coin Co., 6310 S. Campbell Ave., Chicago.

REFORMATION Medal 1917. Missouri Synod. Silver — $1.50. Aug. Zitzmann, Morristown, Minn.

$36.75, CRISP, Villa Currency, 35c. Moore Coin Company, Commerce, Texas.

15 COINS, 30 cents per package. Sample coin trays, 25 cents each. Order now. C. Johnson, 100 Maiden Lane, New York.

$4.25 EACH paid for U. S. Flying Eagle cents, dated 1856. We pay cash premiums on hundreds of old coins. Send 10 cents for New Illustrated Coin Value book, 4x6. Get posted. It may mean your fortune. Clarke Coin Co., Box 15, Le Roy, N. Y.

OLD Coins, Large Spring Selling Catalogue of Coins for Sale, free. Catalogue quoting prices paid for coins, ten cents. William Hesslein, 101 Tremont St., Dept. M, Boston, Mass.

CALIFORNIA Gold: Quarter size, 27c; Half-dollar size, 53c; Dollar size, $1.10. U. S. 3c piece and catalogue, 10c. Norman Shultz, King City, Mo.

MANUAL TRAINING SHOP EQUIPMENT AND MATERIAL

TEACHERS and pupils organize UmakeM Community Shops. Replace saloons. Profitable. UmakeM Company, Fifth Avenue, New York.

FOR BOYS

LEARN how to pitch curves! Complete manual and rules by the world's greatest masters. Pitching course complete 25c, with large catalog. World Novelty Co, 2204-P, Michigan Ave., Chicago.

BOYS—You can make big money in your sparetime by taking orders from your friends for Monogram Belts. See our ad in Salesmen Column, this issue.

BOYS—Earn a Structo outfit or cash commission for selling 25 packages Kleen-Nu Rayno Chemical Works, Freeport, Ill.

BIG Book for Boys—The Boy Mechanic, Vol. II—A sequel to, but containing nothing found in Vol. I. Tells all about 1,000 interesting things to make and do. 480 pages; 995 Illus. Cloth. Price, $2.00, postpaid. Popular Mechanics Book Dept, 6 N. Michigan Ave., Chicago.

CAMERAS AND PHOTO SUPPLIES

SIX Amazing Camera Values. Don't send a penny. Seeing is believing, so just mail your order and any of the following wonderful bargains will be shipped to you the very same day C. O. D. with privilege of examination. First: $9.75 No. 1 Seneca Jr., with Meniscus Achromatic lens, $8.9. Second: $76.00 No. 1 Autographic Kodak Special with Bausch & Lomb Zeiss Tessar F:4.5 in Optimo shutter, $57.50. Third: 5x7 Conley XV, F:6.3 Wollensak in Compound shutter, $60.00 value, our price $38.75. Fourth: Autographic V-P Kodak, F:7.7 lens, sells for $14.50, our price $11.75. Fifth: $7.40 No. 2 Folding Carriage Premo, $5.98. Sixth: $12.00 Rexo Jr., R. R. lens, $9.95. Equip your camera with a high-speed lens. The F:6.3 Ilex Anastigmat in Ilex Acme shutter up to 1/100 of a second. Special, $14.65. Burrough's Wellcome Exposure record 67c. Order direct from here and order now. Don't delay: A word to the wise is sufficient. The above are items selected at random from our book. Send for this sixty-four page C-a-t-a-l-o-g which is plum full of Bargains. Yours for the asking. David Stern Company, (in business since 1885.) 1027-1029 Madison St., 618 Davsco Bldg., Chicago, U. S. A.

AX-U-LYK-M. Send your next roll 5c and 15c. Will make six prints, one "hand tinted" free. Address Ax-u-lyk-m, Dept. C., Bristol, Vermont.

NEW 1A autographic Kodak Junior, fixed focus, list $14.40. Special $12.75. Chicago Camera Company, 33 West Monroe, Chicago.

FREE—The largest and most comprehensive Bargain List of used and new Cameras and Supplies ever offered. Send for your copy right away. See for yourself how much money you can save. We do not attempt to make a big profit but prefer quick sales that turn our money over faster. We have thousands of satisfied customers all over America and other countries. You can try your selection for ten days. If it proves unsatisfactory, return it and your money will be refunded in full. Central Camera Co., 124 So. Wabash Ave., Dept. E-25, Chicago, Ill.

OLD, Reliable House. Rolls developed Free. Prints 2½c and 3½c. Enlargements 15c to 35c. Virginia Art Company, 117½ Pine St., Richmond, Va.

"PHOTOGRAPHERS." Geo. W. Cary, 3968 Cleveland Ave., St. Louis, Mo., buys Old-Negative-Glass. Write for price list.

FILMS developed, 10c roll. Packs 25c. Prints, Brownies, 3c; 1a, 3x4, 3x5 and Post Cards, 4c. Returned next day. Prepaid. Kodak Film Finishing Co.; 112 Merchants Station, St. Louis.

"EXTRAORDINARY" Photo Finishing: send for latest booklet. Sharpless, Photographer, Orangeville, Penna.

SEND trial order for developing and printing. Pay if satisfied with work and prices. Lyon Photo Works, Moline, Illinois.

IF You Appreciate clear, charmy results, try Virginia Art.

STUDY Photographic Journalism. Pays $2,000 to $5,000 yearly. Camera reporters in demand. Complete course of 12 Lessons by mail $1. Particulars free. J. Rodgers Horgard, Publisher, Windsor, N. C.

DOZEN 4"x6", mounted pictures, from any photo, C. O. D. $1.77. Fell Studio, Libertyville, Iowa.

WILL Your Prints Fade in a year or two? Not if they are Virginia Art prints.

FILMS developed, printed and enlarged by the only system. Our prints last a lifetime. They cannot discolor. Just send 25c with any size film and we will return the next day. Peerless Photo Shop, 25 Willoughby St., Brooklyn, N. Y.

GET the Spring Edition of the Bass 1919 Camera catalog. It's a marvel in camera values. Get also the Bass Monthly Bargain List—another Bass Wonder in values. Here are a few: 5 x 7 Rev. Back Conley Model XV, fitted with F:6.8 Anastigmat lens in automatic shutter, case and 3 double plate holders, condition used; list price $42.00, our price, $30.00. 3¼ x 5½ Premo Model C, plate or film pack, fitted with Bass Planastigmat F:7.7 lens in automatic shutter, 3 plate holders and film pack adapter; condition new; list price $30.00, our price $16.00. 3¼ x 4¼ Korona Petit, plate and film, R. R. lens, Auto shutter 2 holders, condition used; list price $15.00, our price $4.50. 1⅝ x 2½ V-P Ansco F:5.5 Anastigmat lens, like new, our price $14.50. 2¼ x 3¼ No. 2 V-P Ansco F:7.5 Anastigmat lens, slightly used, our price, $10.75. 3¼ x 5½ Premo No. 1, R. R. F:8 lens, ball-bearing shutter, condition like new, price $12.00, our price $4.75. You can't afford to miss these and other bargains. Write for the Bass Monthly Bargain List as well as the Spring Edition of our 1919 Camera Catalog today. Bass Camera Co. 109 No. Dearborn St., Dept. 23-F, Chicago.

COLOR your pictures and enlargements with Photo Oil Colors. New method; quickly learned. Write De Lana Walton, M25, Prairie City, Ill.

FILMS Developed and printed, 6 exposure 25c. American Photo Co., 5700 Indiana Ave., Chicago, Ill.

CASH paid for cameras, lenses, revolvers, musical instruments, guns—trade in for camera. Mutual Exchange, 1111 Newton Ave., No., Minneapolis, Minn.

CAMERAS, Graflex, Lenses bought, sold and exchanged. Guns and revolvers taken in trade. Minneapolis Camera Exchange, 505 Kasota Bdg., Minneapolis, Minn.

FILMS Developed 10c. Prints 4c. Wingard, 801 16th Street, Port Huron, Mich.

HYPONO—A four-ounce bottle of Hypono will eliminate hypo from 1,000 plates, films or prints in 3 minutes. 50 cents per bottle, postage prepaid. Send for circular. Liberal discount to photographic dealers. Tom Hadaway, formerly of Allison & Hadaway, 235 Fifth Ave., N. Y.

BEST High Price" kodak picture finishing "South." Send roll and 50c for trial order. Art Studio, Dallas, Texas.

MAIL us 15c with any size film for development and 6 velvet prints. Or send 6 negatives any size and 15c for 6 prints. 8x10 mounted enlargements, 35c. Prompt, perfect service. Roanoke Photo Finishing Co., 209 Bell Ave., Roanoke, Va.

ANY six or eight exposure Film up to Post Card size developed and printed 10c, or enlargement 8x10 your favorite negative 25c. Special Introductory offer to show high quality work. Associated Photo Co., Dept. 11, Cincinnati, Sta. A.

KODAK Films developed, any size, 5c each. Prints any size 3c each. Superior service. L Company, 289 Ludlow Ave., Cincinnati, O.

GET my tanks and make big money developing films. Particulars free. Gillett, Boscobel, Wis.

$10.00 TO $25.00 a day for Amateur Photographers. Twenty-five cents for Plans. I have operated successfully seven years. Tranah Studio, Chelsea, Oklahoma.

SOMETHING New in Kodak Finishing—Our Fancy Bordered Prints, same price as old-style Finishing. Developing Ten Cents. Printing Vest Pockets, 3c; No. 2, 2A, 4c; 2C, 3, 3A, 5c; 8x10 enlargements, Free. Tranah Studio, Chelsea, Oklahoma.

PHOTOS Enlarged. Genuine Sepias 16x20, by insured mail $3.15. Soldier's photos our specialty—work guaranteed. Write for prices. Agents wanted. National Portrait Enlarging Co., 1976 Park Ave., New York.

BIG bargains in new cameras. Over 150 in our free catalogue. Blickenstaff's Studio, North Manchester, Indiana.

SPECIAL—Kodak finishing done at lowest prices. Rolls developed at 10 cents—any sizes—send for print prices and coupon for roll development free. Rees Foto Shop, Churubusco, Indiana.

WANTED—View camera. F4.5 Velostigmat lens. Write Todd, Rainbow Lake, New York.

PROFESSIONAL Developing, Printing and Enlarging. Photo Pillow Tops, Crayon Portraits, etc. Best workmanship. Satisfaction guaranteed. Write for price lists today. The Liberty Photo Co., Dept. "B." Owego, N. Y.

CAMERA Bargain List Free. Durso, 25 Mulberry St., N. Y. City.

"CAMERA Kinks and photo fads." A booklet of 25 money-making photographic processes and formulas. Tells how to make transparent photos on watch caps, chinaware, etc. Chemical oil photos, novelty photo plaques, red firelight photos, perfectly titled negatives, photos on silk, stationery, etc. Price, 25c, postpaid. E. Greenhalgh, 45—The Lexington, Indianapolis, Ind.

SPECIAL Offer—Your next kodak film developed 10c and prints 2c each. Best workmanship. 24 hours service. Enclose money with order. Write for price list "C" and sample print. Johnston & Tunick, 53 Nassau Street, New York.

SIX Postcards from your negative for the names of ten camera owners and fifteen cents (half price). David N. Essick, Ankeny, Iowa.

FREE—Developing, prints 3¼x5½ and smaller, 2½c; 8x10 enlargements, 25c. Order yours today. Gem Studio, 462 Wabasha St., St. Paul, Minn.

SIX Exposures developed and printed, 35c. Expert workmanship. Royal Stamp Co., 422 N. 52d St., Phila., Pa.

ANY Size film developed and six prints, 20c. Coupons for free enlargements, Prompt service. Superior Photo Service, Lebanon, Ohio.

SPECIAL Offer. We finish 6 exposure roll (one only) and furnish 6 select prints for 25c with order. Try us. Money back if dissatisfied. Moreau's Kodak Finishing Service, 630 Nicollet Ave., Minneapolis, Minn.

SPECIAL Trial Offer. Your next Kodak film developed 5c. Prints 2c each. Moser & Son, 1917 St. James Ave., Cincinnati, O.

EQUIP your camera or kodak with a Wollensak Lens and Shutter and obtain the best possible results. Beautiful descriptive folder "B" sent on request gratis. Wollensak Optical Co., Rochester, N. Y.

BENKO'S Dark-Room can be used anywhere, indoors or out, by day or night, for Photo, Radio or Micrography, write for circular. Benko Bros., 117 E. 15th St., New York City.

DO you take pictures? Write for free sample of our big magazine, showing how to make better pictures and earn money. American Photography, 790 Pope Bldg., Boston, Mass.

OUR Regular Prices, Prints 3c Each, Developing 5c Roll any size. One trial, that's all we ask. You'll come back for more. Photo Service Shop, 929 McMillan, Cincinnati, Ohio.

BIG Money Saved on Photographic Lenses and Apparatus—goods exchanged; repairing done. Amateur finishing and enlarging done promptly and reasonably. Price list application. Ralph J. Golsen, Argyle Bdg., 1128 Argyle St., Chicago, Department P.

DEVELOPING, Printing, Enlarging. Exclusively for the Amateur Photographer. Send for Price list and special offer. Chicago Photo Finishing Co., 54 W. Lake St., Dept. A, Chicago, Ill.

MOVIE Cameras, Tripods, Projectors, Movie Supplies Printing and Developing for the Trade. Cincinnati Motion Picture Company, Manufacturers, Cincinnati, O.

MOTION PICTURES

PHOTOPLAYS in demand. Make extra money. We show you how. Details free. Rex Publishers. Box 175, H-54, Chicago.

MOVIE Film for Home Machines; 200 ft. $1.50. Send stamps for list today. William Batt, West Haven, Conn.

MOTION Picture Films — New. Chas. Stanek, Orient, Iowa.

MOTION Picture Operation, Stage Electrics and Illusions—The only practical handbook and guide published for motion picture operators, theater electricians and managers. A thoroughly practical and useful book, covering the subject comprehensively. Pocket size, leatherette. 393 pages, fully illustrated. Price, $1.50 postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

GOOD income nightly on small investment. Buy complete Guaranteed Moving-Picture Outfit direct from manufacturers and save money. Easy payments. No experience needed. Catalog free. National Moving Picture Co., Dept. PS., 537 S. Deaborn St., Chicago.

MAKE money writing Photo-plays; details free to beginners. No correspondence course. Producers League, 230 Wainwright, St. Louis.

EASY to make $$$. Direct from manufacturers. Complete moving Picture outfit—professional machine, film supplies, etc., furnished. Easy installments. Operating instructions furnished. No experience needed. Free Catalog. Dept. M2, Monarch Film Service, 228 Union Avenue, Memphis, Tennessee.

FREE to Writers—A wonderful little book of money-making hints, suggestions, ideas; the A B C of successful story and play writing. Absolutely Free. Just address Authors' Press, Dept. 12, Auburn, New York.

BIG Profit Nightly—Moving Picture Business—small capital starts you, easily accomplished. Teach you—furnish everything. Ralph J. Golsen, Argyle Bldg., 1128 Argyle St., Chicago, Dept. M.

MOVIE Portable projectors for Office, Home, Factory. Dealers wanted. Cincinnati Motion Picture Company, Manufacturers, Cincinnati, Ohio.

TRADE SCHOOLS

EARN $40 to $100 weekly. Learn Paperhanging, Decorating, Sign and Scenic Painting, Showcard Writing, Graining. Catalogue Free. Chicago Painting Schools, 131 North Wells Street, Chicago.

HILE'S Watchmaking and Engraving School, the largest and best equipped school in the West. 717 Market Street, San Francisco, Cal.

EDUCATIONAL AND INSTRUCTION

BE a Finger Print Expert—$25 to $50 a week in this new and fascinating profession. Write—find out how you can learn at home to supply the big demand for finger-print experts in banks, big factories, detective agencies, etc. Special limited offer—send for free illustrated book. Tells all about Finger Prints. University of Applied Science, Room A919, 1810 Wilson Ave., Chicago, Ill.

DOUBLE Entry Bookkeeping mastered in 60 hours; guaranteed; 20 lessons, $2. International Bookkeeping Institute, Springfield, Mo.

YOU Earn $1,500 Upwards Yearly. Learn Real Estate brokerage. You can absolutely master this exceedingly profitable profession in a short time by the study of our invaluable and highly recommended publications, two of the most important being "How to Sell Real Estate" cloth 272 pp. 12mo $2.50; "How to Conduct Real Estate, Ins., and Gen. Brok. Bus." $1.25. Order now. Absolute satisfaction guaranteed. Free catalogues. Realty Book Company, Dept. 27, Cleveland, Ohio.

BE a Stage Cartoonist. Experience unnecessary. Haffner, 3014 Dauphin, Phila.

FREE Tuition by Mail: Normal, Grammar School, High School, Bookkeeping, Shorthand, Typewriting, Civil Service, Agricultural, Drawing, Domestic Science, Engineering, Automobile, Salesmanship, Law and Real Estate Courses thoroughly taught by mail. Membership Fee, $10.00; tuition free. For "Free Tuition Plan," address, Carnegie College, Rogers, Ohio.

BREAK Into the Newspaper Game—As a correspondent or City Reporter. Our correspondence course endorsed by leading editors. We give instruction and actual experience. Write for prospectus. American Institute of Journalism. "A Newspaper School Run By Newspaper Men." 22 Hawley Street, Boston.

MECHANICAL Drafting — I have arranged a short and simple course in mechanical drafting suitable for students, mechanics, purchasing agents and executives. My practical course will add to your earning capacity. Write for particulars. Fred W. Thomas, 335 Guardian Bldg., Cleveland, Ohio.

WORLD-ROMIC System, Masterkey to all languages. Six textbooks $1.44. French Chart, 37c; Spanish, 37c. Chart Organs of Speech, 37c. Universal Alphagam (list human speech-sounds) 97c. Special Alphagams (lists sounds twelve languages) 97c. Languages, 143 West 47th, New York.

LEARN to read blue print drawings easily, see Machinery column.

ARTIFICIAL Marble, sanitary flooring instructions, ornamental casting, concrete, plaster, papier-mache decorations, garden furniture, statuary. Rubber-moulds, Electrometallurgy, particulars and 200 illustrations free. Mahler, 721 90th St., Woodhaven, New York.

MOULD making for ornamental casing, particulars, 200 illustrations, free. Mahler, Woodhaven, N. Y.

LEARN Drafting—One of the most practical subjects, and indispensable in many occupations. Individual study at home without an instructor may be successfully carried on with the aid of our book, "A practical Course in Mechanical Drawing." 160 pages, 157 drawings. Cloth. Price 50 cents postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

WRITE articles, stories, news, in spare time for newspapers and magazines. Big pay. Copyright book free. Press Syndicate, 552, St. Louis, Mo.

INVENTORS—Write for our illustrated guide book, "How to Obtain a Patent." Send model or sketch and description for free opinion of its patentable nature. Highest references. Prompt attention. Reasonable terms. Victor J. Evans & Co., 167 Ninth, Washington, D. C.

LINOTYPE Instruction; Empire School, 133 E. 16th Street, New York.

TELEGRAPHY

COMPLETE Correspondence Course in wireless by expert government licensed instructors in largest radio school in America. Special profit sharing plan for the successful students which guarantees a saving of 10% on cost of tuition and an estimated saving of 50% or more. Also post-graduate course free in our Washington school. Full commercial course for first grade license requires 16 weeks; tuition reasonable, easy terms. Positions pay $110 per month and living expenses, up to $3,500 per year. Practice set free with text books (one for each lesson) prepared by our experts. Write for handsome booklet with full details of profit-sharing plan and other features. Service Radio School, Dept. H, 902 Pa. Ave., Washington, D. C.

TELEGRAPHY (both Morse and wireless) and Railway Accounting taught thoroughly and quickly. Big salaries now paid. Great opportunities. Oldest and largest school—established 45 years. Catalog free. Dodges Institute, 1st St., Valparaiso, Ind.

TELEGRAPHY — Morse and Wireless — taught at home in half usual time and at trifling cost. Omnigraph Automatic Transmitter will send, on Sounder or Buzzer, unlimited messages, any speed, just as expert operator would. Adopted by U. S. Govt. and used by leading Universities, Colleges, Technical and Telegraph Schools throughout U. S. Catalog free. Omnigraph Mfg. Co., 41-G Cortlandt St., New York.

WIRELESS

GOOD Receiving Sets $8.50 up. Radio supplies. Catalog for stamp. Jenkins, 921 Purchase, New Bedford, Mass.

HOW to Become a Wireless Operator. This 300-page book is the only one published which has been specifically planned to give a knowledge of principles and operation that will enable the reader to enter the field commercially. 200 illustrations. Cloth. Price $1.50 postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

BUSINESS OPPORTUNITIES

GREATEST, biggest and best collection of Modern Money-Making ideas printed. 2600 ideas, opportunities and secrets. Oscar Hanson, Mentor, Minn.

400% PROFIT manufacturing "Puffed Crisp." Delicious confection. Whirlwind money-maker. Machine, Instructions complete $6.50. Samples 10c. Bestever Products Co., B-6, Douglas Park Sta., Chicago.

IF you are tired of working for other people, if your income is too small, or if you are looking for something to do during your spare time, write for big Money-Making propositions. It will put you right. C. Trivett, Trade, Tenn.

ZINC Cut—Make your own at little expense. Complete instructions $1.00. Todaro Specialty Co., Dept. 5, Monessen, Pa.

WHY sell Perfumes, Toilet Goods and Flavoring Extracts for others? Make your own; write Laboratory, Box 1316-M, Memphis, Tenn.

SLOT Machines—Headquarters for premium machines. 1016 Germantown Ave., Philadelphia.

INTRODUCTION Price for our guaranteed $500 "Silvering Mirrors Process," 50c. (May and June only.) Formula Research, 3803 Scovill Ave., Cleveland, Ohio.

CHEMICAL Analysis honestly and correctly done by the Institute of Science, Colton, N. Y.

MONEY in Candy. Become independent and wealthy in an absolutely new business. Manufacture and sell "Genuine Creole Pralines." Big profits, easy to manufacture and tremendous demand. Are now being nationally advertised. We start you and furnish everything. Send now for full information. Dept. M16, Southern Praline Co., New Orleans, La.

ENTER a new business. Earn $3,000 to $6,000 yearly in professional fees making and fitting a foot specialty, openings everywhere, with all the trade you can attend to; easily learned by anyone at home in a few weeks, at small expense; no further capital required, no goods to buy, job hunting, soliciting or agency. Address Stephenson Laboratory, 11 Back Bay, Boston, Mass.

WANTED—Men to manufacture marble and onyx in United States and Canada. Manufacturing rights arranged. Grumman, Zanesville, Ohio.

PATENT Buyers names free on request. Patent News—f, Washington, D. C.

MAKE Big Money installing farm lighting plants. Battery charging outfits, supplies. Get our special demonstrating offer and agency plans at once. Acme Engineering Company, Louisville, Ky.

MANUFACTURE and sell your own products. Little money required. Guaranteed formula $1. Sales plan. Supply sources free. Fox Sales Co., Sta. H, Buffalo, N. Y.

YOUR chance in life to own a dignified profitable business. We teach you the real estate, Insurance and business brokerage. Earn $5,000 yearly; no capital required; office at home; stamp for booklet. Hayes Realty Association, Cincinnati, Ohio.

START a Vacuum Clothes and Carpet Cleaning business. $150.00 for machinery required. Write today. General Compressed Air & Vacuum Machinery Co., St. Louis.

BE a Manufacturer. Make your own goods. Get all the profit. Big income assured. Write for key. G. Bucknam, Box 2792, Boston, Mass.

HURRY! Our first issue. Plans and specifications for building National Advertising Weather Service. Six feet in height. Standard make instruments. Agents profit $150. Twelve card capacity. Descriptive literature, terms and picture 25c. None free. National Sales Co., Box 421, Lima, Ohio.

WE have capital and organization to market any product that will sell in the United States. Send us description, etc., of what you have. "Lloyds," Bradley Beach, N. J.

LEARN Photo Coloring. Profitable work quickly learned. Write De Lano Walton, Prairie City, Ill.

A MONEY-MAKING home business. Send 10c for instructions and a sample of raw material. H. L. Cowell, P. O. Box 1338, Boston, Mass.

"THE Water Frog." Why drudge along in the city when you can make $400 a month on any beach? My plans show you how to build for $120. Blue prints and working instructions complete $2. H. Mowatt, 502 Winch Bldg., Vancouver, B. C.

OUR Free List of Money Makers will make your spare time earn you $$. The Duplex Supply House, 206 S. Payson St., Baltimore, Md.

MAKE $50 to $125 per week repairing Radiators—Start a shop of your own—Be your own boss—Unlimited opportunities—Increasing demand—Small Capital starts you—Our Book "Modern Radiator Repairing," disclosing latest methods, formulas and trade secrets, enables any one to become a Radiator Expert in few days—Postpaid $1—Don't hesitate. Smyth Publishing Co., 34 Bollingbrook St., Petersburg, Va.

"668 WAYS to make money." 2,716 formulas. "Encyclopedia Business Opportunities," 3 volumes $1. "Ideal," 5501-FE North Robey, Chicago.

WE Start you in business manufacturing "Puffed Crisp." Delicious confection; whirlwind money maker; begin at home or small room anywhere; machine and instructions complete, $6.50; samples, 10c. Bestever Products Co., B-6, Douglas Park Station, Chicago.

BUSINESS Suggestions, home industries, small inventions. 230 pages. 60c. Ask for circulars. T. Perez, 729 McKinley St., Elizabeth, N. J.

EXPERT Chemical Service. Commercial Analysis, Instructions, Formulas, Processes and Trade Secrets. Manufacturing problems solved. Satisfaction guaranteed. Write for Lists and Valuable Information. W. L. Cummings, Ph. D., 228 Gordon Ave., Syracuse, N. Y.

STEREOPTICON Business. Stock, Special Tools and Patterns. Excellent chance. Merit Machine Mfg. Corp'n, 465 Greenwich St., N. Y.

GO in Business! "Opportunities' Beckoning List"—Free! Southern Business chances. Southern Business Exchange, Empire Building, Birmingham, Alabama.

"MAIL-ORDER Money—How to Make It"—tells how to develop a paying business at home. Clear, concise, reliable. Send 12c for booklet and valuable information. James J. Cutler, Reading, Pennsylvania.

BIG Money in Candy. Send for the "Pilot," most practical and accurate book of candy, ice-cream and soda fountain formulas ever published. Money back if not satisfied. Price $4.00 postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago, Ill.

CASH in on Bone-Dry Bill. Make $8 a day easy. Will show you how with our Concentrated Pure Fruit Drinks. Wanted everywhere, small package — just add water. Here's the chance of a lifetime. Grab your territory. Write quick. American Products Co., 593 American Bldg., Cincinnati, O.

SILVERING Mirrors. I make the French Plate. Easy to learn; immense profits. Prospectus sent free. Sam Wear, Excelsior Springs, Mo.

START a Small Factory. Make and sell New Patented Ironing Board. Cost 50c, sells for $2.00. State rights for sale. Write for Details. Cato, 231½ So. 6th, Springfield, Ill.

LEARN to Make Beautiful Plate Glass Mirrors by new, easy process; complete instructions, $1.00. Freeman Bros., 120 Laurel, El Paso, Texas.

AMAZING Profits Manufacturing Your Own Goods. Start a business of your own, make and sell Magic Polishing Cloth; sells to stores and agents. Formula only $1. H. Smith, 1218 Marquette St., Racine, Wis.

MIRACLE Motor-Gas May Mean Your Fortune. New discovery amazes motorists. 3c worth equals gallon gasoline. Knocks out carbon. Distributors getting rich. 300% profit. Isom, Idaho, wires "Ship 500 packages. Made $62 yesterday." Write quick for exclusive State or County agency. Chas. A. Butler & Co., Dept. 171, Toledo, Ohio.

SUBSTANTIAL Manufacturing Corporation wants capable men to establish branch and manage salesmen. $200 to $1,000 necessary. Will allow expenses to Baltimore, as explained. Address Treasurer, 431 North Howard Street, Baltimore, Md.

DOLLARS yearly in your backyard. No ginseng, mushroom dope. New ideas. Investigate. Particulars free. Metz, 313 East 89th, New York.

THE Enricht Chemical Technical Laboratories at Harmingdale, N. Y., offer their services to Manufacturers in Research work to improve and cheapen their output. Terms moderate. Correspondence solicited. Results guaranteed or no charge.

PROFITS: Make President Wilson plaster paris ovals. Instructions and mould, $2.00. P. B. Spahr, York, Pa.

MAKE Money at Home. Supply small store trade. Demand already created. $5 to $10 a day easy. I furnish outfit and instructions at small cost. Details free. G. C. Hart, 34 Catherine Street, New York.

I MADE $30 a week at home. French breadmaking, 15 years' experience. Free booklet tells how to start without capital. Ashbrook, 67 Marengo, Ohio.

LADIES or Gentlemen. Be independent. Start your own business. We teach by mail to manufacture highest grade toilet preparations. Results guaranteed. Send for particulars. School of Cosmetics, Box 378, Omaha, Nebr.

MAKE Die Castings. Sketch, sample, booklet and proposition, 12c. Byrd & Blair, Box 227-A, Erie, Pa.

BE independent, manufacture guaranteed automobile and furniture polish. Guaranteed formula $1.00. Herbert Kunisch, St. Cloud, Minn.

PATENTS Procured—Trade Marks registered. A comprehensive, experienced, prompt service for the protection and development of your ideas. Preliminary advice gladly furnished without charge. Booklet of information and form for disclosing idea free on request. Richard B. Owen, 30 Owen Bldg., Washington, D. C. 2276-R Woolworth Bldg., New York.

INCORPORATE your business under the Delaware law. No organization tax; no franchise tax; no federal corporation tax; certificates not taxable; stockholders exempt from company debts; do business anywhere; directors reside where you wish; lowest cost organization possible. Common Law Organization Co., 7 Randolph, Detroit, Mich.

WE Start You in Business, furnishing everything; men and women, $30.00 to $100.00 weekly operating our "New System Specialty Candy Factories" anywhere. Opportunity lifetime; booklet free. W. Ragsdale Co., East Orange, N. J.

MAIL Order Business is your opportunity. Brenner's Famous Handbooks teach how to start small, grow big. Sell merchandise, service, ideas: enormous profits. Spare time to begin. Get complete set, 10 books, $2, and be posted. Brenner, 335 Walnut, Philadelphia. Descriptive Catalogue and big catch interesting mail order information, 25c. None free.

SILVERING Mirrors! My exclusive French Tartaric method opens enormously profitable business. Booklet Free. H. Barsow, 514 23rd Street, Oakland, Calif.

LEARN the collection business. Good income, quick results. Interesting booklet, "Skillful Collecting," free. National Collectors Assn., Long Street, Newark, Ohio.

CAPITAL Procured for meritorious enterprises. Companies incorporated. Herbert, 903-A Webster Bldg., Chicago.

MANUFACTURE Kor-Kit—Only Successful Guaranteed Powdered Puncture Cure. Wonderful Invention. Carbo-Cide the New Automobile Fuel, Intensifier, Decarbonizer, Increases Speed, Saves Gasoline. Manufacturing Particulars of these and many other Advertised Automobile Specialties for sale. Miller, Ph. D., Tampa, Florida.

VULCANIZING Auto Tires is a growing and profitable business. Instruction Book, $1. Plants, $50 and up. Equipment Co., 208 8th St., Cincinnati, O.

GOOD money easily earned at home, spare time silvering mirrors; no capital. Free instructive book tells how. Patterson & Co., Brooksville, Ky.

SEND 25 cents, money order, for Booklet, contains money making formulas, Trade Secrets, Cooking Receipts, Medical, Household and Mechanical hints, a book for everyday use. Be an Agent, make money selling them to friends, big commission. The Service Press, P. O. Box 535 Springfield, Mass.

TEN cents capital will start any inexperienced person a business paying $4 up first day reconstructing inner tubes. A new discovery makes formerly useless tubes like new with absolutely no competition. Makes one good tube from two or more blowouts. Buy a torn 32x3½ tube for a few cents. Make 36x3½ by this method. Sell for $2. Profit $1.75. Or do the work for motorists charging $0.75. Profit $0.73 and saving cost of new tube. Equipment for one hundred costs nothing. Complete illustrated treatise arranged and obtained only from DuMauier Company, Home Street, Elmira, New York. One Dollar. After June fifteenth Five Dollars.

FORMULAS AND TRADE SECRETS

1,000,000 FORMULAS, Processes and Trade-Secrets for every business. 1016 pages, $2. "Ideal," 5501-FM, North Robey, Chicago.

FORMULAS, Imitation Marble and Onyx Stone Finish, $5.00 each, $7.50 for both. E. A. Butler, Room 33 Steel Bldg., Waterbury, Conn.

500 MANUFACTURING Secrets, 25c; Gas tonic, Mechanics soap, Renewing dry batteries, Egg substitute, Resilvering mirrors, Luminous paint, 20c each. Entire collection, 50c. Catalog, 2c. "The Ideal," 5501-F North Robey, Chicago.

MANUFACTURING Processes, Formulas, Technical Information. Interesting booklet free. Consulting Chemist, Box 24, Little Falls, N. J.

MANUFACTURING Processes, Formulas, Technical Information. Interesting booklet free. Consulting Chemist, Box 24, Little Falls, N. J.

PRESERVE Eggs—Chinese method—Used for centuries. Material 50 dozen for 10c. We guarantee process. Send 10c for formula. International Chemists, 612 Lincoln Inn Court, Cincinnati.

70 FORMULAS, 10c. Fitzgerald, 15 West 60th St., New York.

COMPLETE Instructions Preserving Eggs 10c. E. Olsen, 352 Buena-Vista, Los Angeles.

RUBBER Formulas for everything in rubber, tires, tubes, quick repair stock, cements and mechanicals. Best of Bank References. Write Rubber Compound Bureau, 727 Second National Bank Bldg., Akron, Ohio.

FOUNTAIN Syrups. Chocolate, orange and lemon. $1.00 each. M. J. Arnesen, Technical Consultant, 6321 Bartmer Ave., St. Louis, Mo.

LUMINOUS Paint, Silvering mirrors Formulas 25c. Benj. Zitka, Fairview, Mass.

ANY Formula Manufacturing Trade Secret. Krause, 2746 So. Karlov, Chicago.

SEND 10c. I will mail you a printed formula for making a delicious and profitable Pop-Corn Confection. Jesse L. Sanders, Lunch Room, 212 W. Court St., Paris, Illinois.

FORMULAS. Make money on the side. Mechanics Hand Soap, Furniture Polish, Gas Tonic, Luminous Paint and two others, all for 35 cents, money order. P. O. Box 535 Springfield, Mass.

AGENTS WANTED

MEN and Women earn $30 to $50 weekly selling new product, revolutionizes wash day methods. Dirtiest clothes spotlessly cleaned without rubbing; does not injure finest fabrics. Manufacturers refund full purchase price to everybody not satisfied after two weeks' trial; guarantee coupon in every package. Write C. E. Uhler, Sec'y, 720-734 South Dearborn, Chicago.

NEW Wonderful Seller — "Concentrated Soft Drink Extracts." (Non-alcoholic) Delicious, cool refreshing drinks made instantly. Just add water. Sells like wildfire to homes, stores, fairs, picnics, parties, ball games, everywhere. A flavor for every taste. Orangeade, Lemonade, Raspberry, Grape, Cherry, etc. Guaranteed under pure food law. Sell everywhere. $50 to $100 weekly easily made. Prohibition laws mean big business. Don't wait—get started quick. Territory going fast. Write immediately for Special Offer. Bestever Products Co., SD-6, Douglas Park Station, Chicago.

EVERYBODY should use "Sweetheart's Cream," wonderful complexion beautifier. Bottle, 50c. Live agents wanted. Hamilton Manufacturing Co., Barnes City, Iowa.

MONEY in Candy. See our add under "Business Opportunities." Dept. M16, Southern Praline Co., New Orleans, La.

MAKE and Sell Your Own Goods. Machinery unnecessary. Expert chemists advise. Special attention to beginners. Write for formula. Catalog. Blake Mystic Company, Washington, D. C.

WANTED—Resident Agents to market a new, fast selling household invention; particulars free. Variety Supply House, Hartford, Conn.

AGENTS: Big money selling great household invention. Sample 25c, particulars free. Webster & Co., 2935 N. Clark St., Chicago.

RIDER Agents Wanted. We furnish guaranteed rebuilt Motorcycles at wholesale. Every part made perfect and thoroughly tested. All makes, singles and twins, $35 and up. Write for proposition and free price list. Western Supplies Co., 359 Hayutin Bldg., Denver, Colo.

ENORMOUS demand: Sell Tankil: modern auto-fuel; guaranteed; 100 to 200% profit—"Vapor-Spray" system burns water. Adds tremendous power. Tankil, Cleveland, Ohio.

AGENTS—"Get into the house by invitation." Send 25c for plan. Copy Shop, Freeport, Ill.

SIGN Letters, foil and specialties for windows. Genuine gold. Anyone can put up. $50 week easily made. Chicago Sign System, 326F, River St., Chicago.

WANTED—Crew managers; agents don't accept a proposition until you get our particulars and samples; money makers. Write H. Parks, Bacorn Company, Elmira, N. Y.

AGENTS—Make Big Money selling Mechanics Guide Hand Book. Sells on sight. Sample 25 cents. Mechanics Guide Pub. Co., 4652 Evans, St. Louis, Mo.

AGENTS — New invention. $10 daily. Send 25c for sample. Money refunded. Box 275, Millersburg, Pa.

MAKE B Money installing farm lighting plants. Battery charging outfits, supplies. Get our special demonstrating offer and agency plans at once. Acme Engineering Company, Louisville, Ky.

AGENTS: Why not sell the greatest Mother song ever written? Also patriotic book marks. $2.00 per hundred. Samples for 10c. Lenox Co., 101 W. 42nd St., N. Y.

STATE agents wanted for the Everready Tool Case for Fords. Everready Tool Case Co., Casselton, N. Dak.

NEW Pictorial History World War containing Peace Treaty League of Nations. Biggest chance yet for money making. Be first, biggest terms, outfit free. Historical Book Co., Chicago.

CHEMICALS to make 100 bottles Toilet water $2.00 postpaid. You sell $25.00. Scientek Laboratories, Madison, Maine.

HOW Much Gasoline can you sell at 2c per gallon? World tests for Four years to prove it. Secure exclusive rights for your county. "Carbonvoid," Box "H," Bradley Beach, N. J.

1,000 LIVE Agents $3.00, Trial 100—30c. 1,000 Prosperous Farmers $2.25, Trial 100—25c. Prices on other classifications. Modern Name Supply, 1572 18th St., Milwaukee, Wis.

OPPORTUNITY for Live Agents: materials that cost 40c I retail for $5.00; so can you. I furnish material and show you how. Craycroft made $120.00 one day—Send 50c for sample of article and full particulars. G. Lee, 3401½ University Ave., Los Angeles, Cal.

SELL best line household necessities. 100% to 300% profit. Every home buys on sight. Large sales—sure repeaters. Casco Chemical Products Co., Dept. A, 22 W. Quincy St., Chicago, Ill.

LUCRATIVE Proposition. Superior article; necessity. Good demonstration, positive sales everywhere. Sample 15c. Particulars. "Williams," 444 Beverly, Milwaukee, Wis.

AGENTS: Every housewife will buy mending tissue. Used for hemming and patching torn clothing. 45c doz., 3 doz., $1.25 prepaid. Send dime for sample. Monarch Tissue and Supply Co., Sharpsburg Station, Pittsburgh, Pa.

MAKE $100 weekly selling a high class imported novelty to retailers, homes and offices. Sells on sight. Write Eastern Sales Company, 703 15th St. N. W., Washington, D. C.

GOOD prices paid for butterflies, insects. See Sinclair's display advertisement on page 16.

MAKE $2.00 an hour taking orders for Goodyear fast selling Guaranteed Raincoats. Profit in advance. We deliver and collect. Sample coat free. Write for territory. Goodyear Mfg. Co., 1038 Lillis Bldg., Kansas City, Mo.

300% PROFIT. Genuine Double Horse-Hide English Tanned Razor Strops Direct to you at astonishing Prices. Persky made $95.00; Bernard $86.50. You can double that. Every Prospect a Sale. $4.00 Sample $1.39. Catalogue and wonderful proposition Free. Jos. Harding & Sons, 1234 So. Harding Ave., Chicago.

AGENTS—Twelve whirlwind sellers—300% profit. G. C. Cain, Medina, N. Y.

$300.00 MONTHLY Selling Best Standard brand tires at wholesale prices to consumer. Free automobile for men that make good. Jack Simons, 2204 Michigan Ave., Chicago.

AGENTS: Kar-Ron-Ex—The guaranteed Auto fuel saves 30% Gasoline, increases power, eliminates carbon. Write for Dealer's Liberal Proposition today. American Sales Co., B-401, Haverhill, Mass.

AGENTS wanted with car. Good territory. New tool, much needed. Garage, tractor and auto owners buy quickly. A real business opportunity. Brumbaugh Bros., L. C. Smith Bldg., Seattle, Wash.

FASTEST Seller Out: Every Home Buys. Samples, Instructions 25 Cents. Order Today. Universal Novelty Co., Charleston, South Carolina.

AGENTS: Magic Gas Tablets, the Guaranteed Auto Fuel saves 30% Gasoline, increases Power, Eliminates Carbon. $10 to $50 a day. Liberal proposition, Exclusive territory. Write United Sales Co., Aberdeen, So. Dak.

A BUSINESS of Your Own—Manufacturing sparkling glass name and number plates, checker boards, medallions, signs, etc. Enormous profits, big illustrated book sent free. E. Palmer, Wooster, O.

$30.00 WEEKLY. New household article creating sensation. Exclusive territory. Goods (postpaid). Act quick. Modern Specialty Co., Los Angeles.

AGENTS answer first? What Kilem will do? Greatest scientific discovery of the age. 10th year. Instant death before your eyes roaches, flies, bedbugs, etc. Outfit, territory free. Write today. Newlyn Co., New Castle, Delaware.

OUR Agents making profits worth while. Are you? Farco, 815 Broad, Bridgeport, Conn.

AGENTS make $150 per month selling Mystol Synthetic Vanilla, "America's Greatest Flavor," to Bakers, Restaurants, Ice Cream Manufacturers and Private Families. Buy material from us, make it yourself, sell at one-half price and make over 150%. Process for making ten cents. Mystol Co., Horicon, N. Y.

GOOD income, spare time, refinishing chandeliers, brass beds, automobiles, etc., by new method; producing amazing results; every household possible customer; experience unnecessary; simple plan of manufacturing at home starts you in a big money-making business; write for free samples showing finishes, etc. Gunmetal Co., Ave. H., Decatur, Ill.

AGENTS—A New One! Harper's Fibre Broom and Ten-Use Brush Set combined. Saves broom expense; lightens housework; easy seller; first order returnable. Harper Brush Works, Dept. X, Fairfield, Iowa.

MR. GALLAHER sold 32 Collection Systems in 7 days. Profit $336.00, costs you $7.00, retails $17.50. Write Sayers Systems, 2813 Sheffield, Chicago.

AGENTS wanted to sell "Middletown Fibre Brooms." Can be guaranteed to customers against any defects. Sample $1.00. Sales Manager, 43 Brown, Middletown, Pa.

MAKE big money selling Eggite, pure Egg substitute, Flavola nonalcoholic flavoring extract. Self sellers, wonderful repeaters. Dougherty Co., 368 Osborn Str., Brooklyn, New York.

AGENTS—Canned condensed milk is popular. Sell milk can openers to jobbers, dealers, etc. Bolin Mfg., 4548 North Long, Chicago.

PORTRAIT Agents. For Quality Portraits at Right Prices, with Quick Service, Write The Service Art Co., Sta. D, Chicago.

AGENTS are coining money selling Cramer Fibre Brooms. Outlast four corn brooms. Retail $1.50. Send 78c for sample postpaid. Also Sanitary Brushes. Cramer Mfg. Co., Wichita, Kans.

AGENTS: Learn about the profits supplying perfume to families by addressing Leifler & Co., 753 Walton, St. Louis, Mo.

RELIABLE People Wanted—Place our new, novel big value goods in stores and appoint agents. Wonder Pudding—25 Big Delicious Dishes 25c—Orangeade Powder 10 big glasses, best drink you ever tasted 10c. Many other good things. Morrissey Company, 4403-5 Madison St., Chicago.

HOUSEHOLD Articles 500%. Great sellers; Sample 25c, refunded if dissatisfied. Osc. Hanson, Mentor, Minn.

WONDERFUL Small Article. Every man needs. Agent sold 14 one office; profit $2.45. Carry hundred in pocket. Particulars and 2 samples 25c. Arrow Mfg. Co., 778 17th St., Milwaukee.

AGENTS. Big profits. $10 day easy. New household necessity. Low price, quick seller. Illustrated literature makes sales easy. Send dime for samples and information. H. Henshaw, Dept. P, Lock Box 450, Cincinnati, O.

NEW patented laundry fork. Prevents torn clothes—scalded hands. Automobile and other household specialties. Sample and particulars 20c. Specialty Products Co., 4932 McPherson, St. Louis.

AGENTS—Make $88 weekly introducing new auto specialty; particulars free. Protective Motor Car Company, Erie Bank, Buffalo, N. Y.

SELL high grade Flashlights 29c to 59c. Batteries 15c to 20c. Remit for sample. Wholesale prices. DuMaurier Co., Home St., Elmira, N. Y.

$75.00 WEEKLY selling Famous pictures, "Human Liberty Bell," "United States Shield," "American Eagle" and 10 other original 11x14 photos of soldiers and sailors in group formations. Most wonderful pictures ever made. Enormous demand. Samples free. Sale producers. Mole and Thomas, 915, 237 So. Wells St., Chicago.

AGENTS—Fine income, 100% profit, selling the Marvelous Chemical Gas Lighter. No spark, no friction. Turn on gas, lights itself. Sample 20c. Illuminal Corporation, 64 Murray St., N. Y.

MEN operating Sugar Puff Waffle Machines earn $35-$70 daily. Machines priced $25 to $150 on trial. Talbot Mfg. Co., 101, St. Louis, Mo.

YOU can make good durable paints and varnish 25c gallon. Emmelmann Bros. Mfg. Co., Dept. 2, Indianapolis, Ind.

PHOTO Pillow Tops, Portraits, Frames, Sheet Pictures, Medallions, Patriotic Pictures, Pennants, War Books. Prompt shipments; samples and Catalogues free to agents; 30 days' credit. Jas C. Bailey Co., Desk D-4, Chicago.

SELL Soft Drinks—Make $10 to $50 a day. Just add cold water to our soft drink preparations and you have the most delicious drinks you ever tasted. Ten kinds, Orangeade, Grape-Julep, Cherry-Julep, etc. 30 big glasses 25c, enough for 200 for $1.00. 85c clear profit on every dollar selling these delicious drinks by the glass at ball games, fairs, dances, picnics, etc. Big money selling the small packages to families, stores, etc. Send 10c for enough for 10 large glasses and particulars postpaid. Morrisey Company, 4403-11 Madison St., Chicago.

300,000 SOLD in one month. Agents who know their business can reap a rich harvest selling "General Pershing's official story of the American Expeditionary Forces in France." Wherever Pershing's name is known you have a sale. Every page illustrated in colors. Contains "In Flander's Field" and "An Answer"—beautifully illustrated in two colors—sells for 25c—liberal terms. Write Herzig & McLean, Inc., 1202 Centurian Building, New York.

AGENTS—Write us for a new article for farmers' use. Perfection Manufacturing Company, Monmouth, Illinois.

ENORMOUS profits applying transfer monograms to automobiles, trunks, bags, etc. Easily and quickly applied to anything. No experience. No paints or laborious hand lettering. Sample Free. Wagner Co., Corona, New York.

BIG Profits for Crew Managers with our proposition. Sample twenty cents silver. Klear Sight Co., 237 West Hazel, New Haven, Conn.

AGENTS: To sell "Valley Pine Oil," Nature's Remedy. Proposition free. The Myer Sands Specialty Co., 5305 Sweeney Ave., Cleveland, O.

INVENTORS—Send sketch of your invention for advice regarding patent protection. Twenty Years' Experience. Hand-book on Patents sent Free. Talbert & Talbert, Patent Lawyers, 4663 Talbert Bldg., Washington, D. C.

THE Best Salesmen join us and stay with us year after year because we pay from 20% to 31% more than others pay for the sale of staple merchandise. Our Sanitary Brushes, Mops and Dusters are in demand in every home, every day and everywhere! Protected territory. Refund on samples. Quick promotion for producers. Big, modern factory and quick shipments. North Ridge Brush Company, 107 Clark Ave., Freeport, Ill.

PERMANENT Salesmen to represent manufacturer of Leading Ford Gasoline Gauge. All cars come equipped with Gasoline Gauges except Fords. Sell to dealers and Ford owners. Your profit more than double cost. Exclusive territory. Detroit Gasoline Gauge Company, Marquette Bldg., Detroit.

SELL new fast selling article, sample 25 cents. Write, A. L. Campbell, North St., Little Rock, Ark.

AGENTS: 100% Profit. Screen door check. Keeps flies out. Stops the bang, saves the door. Big summer seller. Write for free sample to workers. Thomas Mfg. Co., 1362 North St., Dayton, Ohio.

SELL the original and best known Patriotic Photomount. 80% of our men make from $10.00 to $25.00 a day while yet in uniform. No experience necessary. Send $2.00 for outfit and instructions. Novelty Photomount Company, 294 Washington St., Room 338, Boston.

SELLING our sanitary brushes is profitable. Selling under our special advertising system is more profitable. Add our Service Department and you have the best proposition on earth. Take no risks. Write now, Box 180, Lynn, Mass.

AGENTS: Leak-proof bottle cap. Can always be used again on any bottle. Vest pocket stamp box holder. Ten cents in stamps for both articles. Duplex Machine Co., Newark, N. J.

AGENTS—Waterproof Apron. All sizes. Big seller. Every housewife buys. Needs no laundering. Always clean. Durable. 100% profit. Kane sold 70 in one week. Write for samples. Parker Mfg. Co., 278 Call St., Dayton, Ohio.

AGENTS—Every automobile owner wants his initials on his car; you can sell him a set of our gold transfer letters for 50c or $1, making 40c to 90c profit on each sale; $10 a day is easy. Write for sample and general agency. Decalco Transfer Monogram Co., 209 Clinton Bldg., Newark, N. J.

STEAM-NO-MORE for eyeglasses and Auto windshields. Send 10c for 25c sample. Gray's Sales Agency, Port Huron, Mich., Dept. J.

AGENTS Earning $40 to $100 a week on life subscription proposition on well-known national publication exclusive in field. Live wires secure permanent position as district managers on salary. Write Collins, 405 State-Lake Bldg., Chicago.

AGENTS: Marvelous dye soap; brilliant, fast colors; quick, big profits; $75 weekly on Repeat Orders; women amazed; buy regularly; Egyptian Queen Dye Soap a wonder; dyes silk, cotton, wool, one minute; absolutely different; beautiful colors, light or dark; no boiling; will not stain hands; perfect results; no experience necessary; all or spare time; write today; wonderful offer. Other valuable products. Address, Peerless Products Company, Dept. 316, 618 W. Jackson Blvd., Chicago, Ill.

FIVE volume complete History World's War. Agents can double commissions; best authorship, most complete. Also one volume edition; both colored illustrations. Exclusive territory, expensive prospectus, both volumes 50c. K.—Thomas Publishing Co., 509 Wabash Ave., Chicago, Ill.

AGENTS: $5.00 hourly absolutely guaranteed. Gasoline two cents gallon. Money-back guarantee. Write Federal Chemical Works, 20 W. Jackson, Chicago.

WANTED — Representatives everywhere. Exclusive territory. Gold sign letters for stores and office windows. Any one can put on. Write today for free sample. Metallic Letter Co., 431-C, N. Clark St., Chicago.

AGENTS — Something different! Our Eradium (Luminous) Crucifix actually Shines in the Dark. Startling! Mysterious! Wonderful enthusiasm follows every demonstration. 150% profit on every sale. Sole manufacturers. The Pioneer Corporation, 1259 W. 63rd St., Chicago, Ill.

AGENTS—Over 200% Profit. Sell Magic Crystal. Quickest seller, fastest repeater on earth. No talking—free samples sell it. Big weekly repeat-order business. We guarantee the sale of your entire order. Get sample, proposition and Cash-Quality Credit Plan—Sell your customers on credit and run no risk whatever. Diamond Spear Co., Texarkana, Texas.

JUST Out, clever, practical, absolutely new Tie-Form. Everyman needs. You will be delighted. Big profits. 50c for sample. International Supply House, 39 W. Adams St., Chicago.

AGENTS, either sex, make $100 week and up selling complete History of War by Gen. Pershing and others. Official illustrations, maps, etc., 600 pages; sells $2 and $2.50. Immediate shipments; commission 50%; Credit given; outfit Free. Bird Syndicate, Pub'rs, Dept. B, Madison, Wis.

IF you own a Ford you can earn $60 a week selling the Adapto-Tractor attachment. Details free. Write The Geneva Tractor Co., Dept. P, Geneva, Ohio.

LARGE Profits can be made selling Eddy's Combination Automobile Operator's License Carrier and Key-ring. Just roll up your license and carry it with your keys. Every automobilist needs one. Send 25 cents for sample. H. R. Eddy, Meriden, Conn.

AGENTS, Discharged Soldiers. Ford accessory which sells on sight. Offers you biggest opportunity of your life to make money. One agent made $187 one week. Exclusive territory. No competition. Motor Products Co., Indianapolis, Ind.

SELL 24 packages seeds of the wonderful Sensitive Plant at 10c each and get a genuine Panama Hat Free, for boys, girls and grown-ups. Order today. Send no money. The Porto Rico News Co., San German, Porto Rico.

WE Start you on the road to a successful and independent career. You can't fail—$8 to $15 a day the year around. Exclusive territory — direct representative. Largest manufacturing concern—exceptional products—not sold in stores. Needed by every member in every home—repeat orders all year round. This is no time for shoulders—come join this successful organization at once—Men and women—We are back of you with thousands of dollars. T. H. Snyder & Co., 5 Third St., Cincinnati, O.

CONNECT with real money-makers. 500 specialty manufacturers advertise in Specialty Salesman Magazine. 300 Safe propositions to select from. Chuck full inspirational selling talks by best salesmanship writers. Exposes frauds, forces square deal, 100 pages; $2.00 yearly, three months' trial 25c. Read current issue; if not satisfied, money refunded. Robert H. [illegible] 436 Caxton Building, Chicago.

"ZIP-CLEAN"—cleans dirt clean out of everything—rugs, carpets, especially. Cleaning Time Now! Wonderful money maker—sell on trial. 25c, 50c sizes. Merford, 700 Northwestern Building, Chicago.

I WANT 100 men and women to act as my agents and take orders for Comer raincoats, raincapes and waterproof aprons. I paid Eli Bridge $88.95 for orders taken during his spare time in one week. Cooper made $314 last month. Wonderful values. A dandy coat for $4.98. Four average orders a day gives you $2,500 a year profit. No delivering or collecting. I'll give you a sample coat and complete outfit for getting orders. Hurry. Write for my liberal offer. Comer Mfg. Co., Dept. U-112, Dayton, Ohio.

AGENTS: A brand new hosiery proposition for men, women and children. Must wear 12 months or replaced free. All styles, colors and fancy stripes. You can sell at less than store prices. Every home a prospect. Write for samples. Thomas Hosiery Co., 2362 North St., Dayton, Ohio.

AGENTS—Snappiest household line on earth. Red-hot sellers, steady repeaters—100% profit. 500 light-weight, fast-selling, popular-priced necessities. Agents outfit free. Get busy—quick. Write today; postal will do. American Products Co., 594 American Bldg., Cincinnati, O.

BUILD a genuine Choraleon Phonograph and save over half. Fine profits building and selling. We furnish motors, tone-arms and necessary parts. Send for our catalog and free blueprint offer. Choraleon Phonograph Co., 2206 Monger Bldg., Elkhart, Ind.

NEW article, big seller, 3 samples for 25c. Ralph Brandt, Trenton, N. J.

MAKE $10 to $30 a day cleaning wall paper; guaranteed formula, instructions and everything complete to start, 75c. Particulars free. Nelsen, Box 496, Colorado Springs, Colo.

COIN money selling phonograph attachments. Sample $1.25. Write now. Pla-More Phonograph Specialties, 21 E. Van Buren, Chicago.

LYNER Tyres, inside protectors for automobile tires; guaranteed against blowouts and 90 per cent of punctures; transferable. Exclusive territory; big profits. Write for sales-guarantee proposition. Pelletier Rubber Company, Box 322, Cincinnati, Ohio.

AGENTS wanted to sell Eggnit—a pure food substitute for eggs. Easy selling article—big profits—quick repeater. Stuart & Co., 16 Main St., Newark, N. Y.

AGENTS: We have after years' experimenting invented the only non-carbonizing oil-gas producing burner on the market for heating, cooking and baking; guaranteed one year. Atras Mfg. Co., 1608 Fulton St., Chicago.

STRICTLY high-class service. Manufacturing instructions and tested formulas in every line. Latest Automobile specialties, Washing Compounds, Egg Savers, Luminous Paints, Farm Specialties, Toilet Preparations, Chemical Analyses, Matching of Commercial Samples, Special Formulae, Engineering service, Advertising copy, Boxes, Labels, etc. 23 years' manufacturing experience. Catalogue free. Investigate. Industrial Sales Service, 73 Washington, Memphis, Tenn.

COSTS half cent. Sells for dime. Get facts. P. Gilson, 207 S. Sturgeon, Moberly, Mo.

REAP harvest selling farmers. Particulars free. Keating, No. 507 12th Street, Detroit.

WONDERFUL New Chemical. $1 package equals 50 gallons Gasoline. Eliminates Carbon. 50% more mileage, power, speed, guaranteed. Whirlwind seller. Auto owners buy on sight. 100% profit. Repeater. Demonstrating package, terms, territory, for postpaid. Myers & Co., 28 Baird, Cambridge, Ohio.

AGENTS earn $30 and up per week in spare time selling "Maketla Guaranteed Woolen Army Blankets." 100,000 sold U. S. Government; not one rejection; every home and club a prospect; sells for $4.00; write for full information; greatest blanket value on the market. Maketla Co., 611 R-19 Drexel Bldg., Philadelphia, Pa.

AGENTS—Our Spray Auto Washing Brush sells to all auto owners. Attaches to garden hose. Retails $3.50. Commission 40%. Sample $2.00 postpaid. Sanitax Co., 2312 Wabash Ave., Chicago.

IDEAL Sideline. Business men buy on sight. $1.00 seller, 400% profit. K. Home, 3957 Warren, Chicago.

AGENTS — $50.00 daily selling our leatherette soldiers' discharge paper holder. Military emblem stamped in gold. Retails 50c. To you, $3.00 doz. Sample 35c prepaid. Write today. Goldsmith Novelty Co., Dept. 10, 160 No. Wells, Chicago, Ill.

AGENTS: Sell Neverfail Iron Rust and Stain Remover. Huge Profits. Big line. Sample. Write today. Sanford-Beal Co., Inc., Newark, N. Y., Dept. 6.

AGENTS wanted to sell sanitary necessity for every community—large sales, liberal commissions. In replying give experience, goods sold and territory desired. Dail Steel Products Company, Lansing, Mich.

SALESMEN, Local and Traveling, wholesaling, retailing, appointing sub-agents for automobile specialty. Ten to fifty dollars profit per day for live wires. Sold and installed in two minutes. Write for sample. Pacific Auto Necessities Co., 610 Lynch St., St Louis, Mo.

A $2.50 PREMIUM with every $1.98 sale and 70 cents profit for you means Big Daily Profits. Free Sample. Box 500, Shreveport, La.

AGENTS Sell "Hy-Grade," a Carbon Remover of Genuine Merit. 100% Profit. Repeater. Fifer Chemical Co., Marietta, Ohio.

AGENTS sell "In-Ten-So" Ford Headlight Regulators. Every Ford Owner buys on sight. (See our ad under "For Ford Owners.") Immediately write for territory. Continental Auto Supply Co., Dept. H, Davenport, Iowa.

BIG Profit selling Jubilee Spark Intensifier. Banishes spark plug trouble. Sells like wildfire. Exclusive territory. Write quick. Jubilee Mfg. Co., Omaha, Nebraska.

BEGINNERS—"Complete Mail Order System." D-Box 1095, Atlantic City, N. J.

AGENTS—Send for sample "Fretnot"—the washday wonder. Be convinced you can do a whirlwind business. You can clear at least $20 to $100 weekly, according to spare or whole time. You don't have to talk; if she doesn't buy at sight, leave sample; she will be looking for you long before you are able to make the rounds again. Samples furnished free. Premiums for your customers. Exclusive territory guaranteed to agents who can produce. Credit given. Don't call. P. M. Motter & Sons, 3213 Warren Ave., Chicago.

AGENTS make $10 per day selling photos of Pershing—Foch—Wilson—Lincoln—Washington. Sets sell at sight, 50 cents. Send 20c for sample set. The National Bank Note Co., Charles Bldg., 210 St. Clair Ave., Cleveland, Ohio.

300% PROFIT: Agents clearing hundreds weekly. New Washing Compound. Wonderful seller. Big repeater. Nature's mightiest Cleanser. Send for proof; free sample. Fred B. Mitchell, 1314 E. 61 Street, Chicago.

AGENTS: Catchiest Novelty Invented! Aerial Balloon makes youngsters wild with joy. Immensely interesting. Wonderfully quick seller. large profit, unlimited territory. Sample 5c. H. Marul & Co., 33 Broadway, New York.

AGENTS with Fords. Clear $50 to $100 weekly. A. A. Jackson, 1818 Curtis St., Denver, Colorado.

AGENTS—Ideal Steak Tenderer is greatest money-maker on the market. Makes tough steak tender as porterhouse. Housekeepers buy on sight. Over 200,000 in use. Samples free. Tyler Manufacturing Co., Dept. A, Muncie, Ind.

AGENTS make $50 weekly selling Accident and Sickness Policies for $10 yearly. Pays $5,000 death, increasing to $7,500; also $25 weekly benefit for accident or sickness. Quick claim settlements. Permanent income from renewals. $100,000 deposited with state. Address Insurance Co., Dept. K, Newark, N. J.

AGENTS: Big profits selling our New $2.50 Automatic Adding Machine. Quick sales. Ten daily easy. No competition. Anyone having adding to do is positive customer. You'll be glad you wrote us. Bassett Company, 1458 W. Hollywood Ave., Chicago.

TOURIST Phonograph. Buy direct. Save middleman's profits. Write for further particulars. Local representatives wanted everywhere. Colman Mercantile Co., 4421 Manchester Ave., St. Louis, Mo.

MIRACLE Motor-Gas amazes motorists. 3c worth equals gallon gasoline. Eliminates carbon. 300% profit. Isom, Idaho, wires: "Ship 500 packages. Made $70 yesterday." Samples Free. Chas. A. Butler, Sec'y, Dept. 73, Toledo, Ohio.

AGENTS—Big Pay and Opportunity to Earn Automobile introducing wonderful gasoline saver, antifreeze, puncture-proof, five year spark plugs and other economical auto necessities. Outfit free. L. Ballwey, 189 Sta. F., Louisville, Ky.

NOW is the time to sell our Cartridge picture frame; sells on sight for One-fifty, sample one dollar; nothing like it on the market. Benko, 117 East 15th St., New York.

SIGN Letter Agents and Painters: 500% Profit Gold and Silver Sign Letters for Stores and Office Windows. Anyone can put on. Big demand. Free samples. Metallic Letter Co., 431-D N. Clark St., Chicago.

WORLD'S Fastest Selling Auto Accessory! County Distributors wanted; write today. G. L. W. Spring Oiler Co., San Diego, California.

LARGE Manufacturer Wants Agents to Sell guaranteed rainproof coats; prices defy competition; exceptional inducements; enormous profits; no schemes; we deliver and collect; outfit free. Aerco, 121-123 Canal St., New York.

A WHIRLWIND seller for man with auto. Our big Six-In-One tool, the Handy Worker: comprises anvil, vise, pipe vise, drill press, corundum grinder and cutting hardie. Weight 90 pounds. Sells for $20 with fine profit to you. Always pleases. Every farmer, janitor, plumber, private or public garage, small shop, etc., a prospective buyer. No trick to sell it and big money to be made. Write Chicago Flexible Shaft Company, Dept. S. O., 5609 W. 12th St., Chicago.

A NECESSITY That's Different. High-grade Umbrella that can't wear out. No wires to break and punch holes in the cover. Ball and socket principle. A broken rib can be replaced in a moment's time. (We furnish ribs free.) Covered with best wearing quality umbrella fabric. Fitted with detachable or regular handles (your customers' choice) of newest design. You will find The Moulton easy to sell and "The Best Umbrella value obtainable." Send $3.50 for Agents' Sample Umbrella and Selling Outfit, delivered. Exclusive territory and big money making proposition to Live Agents. Secure your territory at once. Money refunded if you are not delighted with sample. The Moulton Umbrella Company, 606 Main St., Wilmington, Ohio.

AGENTS make 500% profit handling Auto Monograms New Patriotic Pictures, Window Letters, Transfer Flags and Novelty Signs. Catalog sent Free. Hinton Co., Star City, Ind.

AGENTS—Quick seller. Big profits; California Rosebeads, selling like hot cakes. Hustlers coining money. New Stuff. Free catalog. Mission, 2819PM, W. Pico, Los Angeles, Calif.

AGENTS are making money with our line of Patriotic pictures, portraits, frames, novelties. Catalogues free. McCormick Co., 315 West Superior St., Chicago.

QUICK selling, newly patented and universally useful invention. Sells any time, anywhere, anybody. Supply carried in pockets. Cost 3½c each, retails 10c. Fine sideline. Send 10c for sample and literature. H. G. Martin, 51 Cliff Street, New York City.

ENORMOUS Profits selling Duo Guaranteed Products. Easy sales at every house. All or spare time. Outfit Free. Write Quick. Duo Co., Dept. H, Attica, N. Y.

REMARKABLE Stretching Cuff Links. Cuffs may be raised over elbows instantly without unbuttoning. Invisible and durable. Great convenience. Handsome profits for high-class salesmen selling direct to wearer. Master Jewelers Corporation, Sheboygan, Wisconsin.

KEROSENE Gas Burners in Cook Stoves, stop use of wood or coal. Patented. Agents getting rich. The Vapor Gas Burner Co., Desk 8, Columbus Ohio.

AGENTS—Sell rich-looking imported 36x68 rugs, $1 each. Carter, Tenn., sold 115 in 4 days. Profits, $57. You can do same. Write for sample offer selling plan; exclusive territory. Sample rug by parcel post, prepaid, $1.19. E. H. Condon, Importer, Stonington, Maine.

AGENTS—If you want to average $10 daily, sell a high-grade line of combs, brushes, mirrors and other novelties in Ivoryware. Direct from factory to consumer. Enormous demand. Particulars free. Yaneco Ivoryware Co., Leominster, Mass.

AGENTS make $100 monthly selling our 500 handy household articles. Catalogue free. Scheff Company, Desplaines, Ill.

AGENTS—New Invention Puzzles World; wonderful chemical cloth; one rub over rain, snow-blurred auto windshield, street car or engine window, presto! glass stays clear 24 hours; can't blur; agents making $120 weekly. Security Mfg. Co., Dept. 83, Toledo, Ohio.

WONDERFUL Adding Machine—Seven-column capacity—retails for one dollar. Sells itself everywhere. Most offices purchase several. Sensational agency proposition. L. J. Leishman Co., Dept. E, Ogden, Utah.

EASY, pleasant work for Mechanics, Shop Men, Clerks, during spare hours; will add many dollars to their salaries. Also want persons who can give full time. Big wages assured. Novelty Cutlery Co., 67 Bar St., Canton, Ohio.

NEW Invention, Big Seller. Devlin Company, P. O. Box 433, Newark, N. J.

AGENTS—Edring's Herb Tablets for constipation make everlasting customers. Control the sale of this Herbal Remedy in your territory. Jet Pharmacal Company, Allentown, Pa.

AMAZING New Invention, Marvelous Adding Machine. Retails $10. Adds, subtracts, multiplies, divides automatically. Does work of $300 machine. Five-year Guarantee. Offices, stores, factories buy from one to dozen. Every demonstration sells. Liberal profits. Write quick for protected territory and trial offer. Calculator Corporation, Grand Rapids, Mich.

DROP Everything Else. Sell Guaranteed Silk hosiery and underwear all or spare time, direct from factory to consumer. Big money maker. Big commissions. Prompt deliveries. C. & D. Company, Dept. 12, Grand Rapids, Mich.

PATENTS—Write for our free illustrated guide book, "How to Obtain a Patent." Send sketch or model for our opinion of its patentable nature free. Highest references. Prompt attention. Reasonable terms. Victor J. Evans & Co., 163 Ninth, Washington, D. C.

PORTRAIT Agents: Our goods will make you big profits. Delivery guaranteed. Rejects credited. Prompt shipments. Send for latest catalogue and prices. Adam J. Kroll & Co., 602 Blue Island Ave., Chicago, Ill.

VULCANIZING auto-tires growing profitable business, especially now. Easy to learn. Instruction book $1. Plants $50 up. Catalog free. Equipment Company, 370 8th St., Cincinnati, Ohio.

"RADIO" Luminous Paint brighter than ever. Replaces expensive Radium Compositions. Large can $1.00. American Luminous Products Co., Huntington Park, Calif.

GASO-TONIC will immediately give full efficiency to poor gasoline. Eliminates carbon. More power. Greater mileage. Easier starting. Absolutely harmless. Good at all times, but absolutely necessary during cold weather. Gaso-Tonic Company, Cincinnati, O.

AGENTS: Big profits. Best and cheapest window letters made. Easily applied. Dime brings five samples. Particulars free. Stalbrite Co., 1115 Second Ave., New York.

AGENTS—Make a dollar an hour. Sell Mendets, a patent patch for instantly mending leaks in all utensils. Sample package free. Collette Mfg. Co., Dept. 404-B, Amsterdam, N. Y.

FEATHER Flowers, the all-purpose Flower. Poultry shows, Exhibitions, Fairs. Clean, attractive, profitable. Sample 25c. De Witt Sisters, Battle Creek, Mich.

AGENTS—If you are earning less than $200 a month, our Sentinel Burglar Alarm proposition for windows and doors will interest you. Many agents earn $15 daily. Both brand new inventions. No competition. Sells on sight to homes, offices. Instantly attached to any door knob or window. No batteries, wires or nails. Handsomely nickel-plated. Provides cheap burglar insurance. Both are big money makers. Write today for liberal terms to agents. Mashall Dobbins & Co., Manufacturers, 1422 Marquette Bldg., Chicago.

INSYDE Tyres, inner armor for Automobile tires, double mileage and prevent punctures and blowouts. Quickly applied. Cost little. Demand tremendous. Profits unlimited. Details free. American Automobile Accessories Co., Dept. P, Cincinnati, O.

AGENTS sell Reliable Custom-Made Raincoats and Gabardines, Big commission. Complete sample line free. Temple Raincoat Company, Templeton, Mass.

AGENTS—Stamping names on Pocket Key Protectors; sample Check with your name and address, 12c. Stamping Outfits, Emblem Checks, Check Fobs, Name Plates. Hart Mfg. Co., Desk 2, 303 Degraw St., Brooklyn, N. Y.

HUGE profits selling Nibco Sanitary Brushes, Auto Washers, Brown Beauty Adjustable Floor Mops, Dustless Dusters, and other specialties. Big line. Fast sellers. Write today. Silver-Chamberlin Company, Department M, Clayton, New Jersey.

AGENTS: Exclusive territory for "World's Best System of Lightning Protection." Big profits and large volume of sales for hustlers. George E. Thompson Lightning Rod Co., Owatonna, Minn.

LARGE Manufacturer wants representatives to sell shirts, underwear, hosiery, dresses, waists, skirts, direct to homes. Write for free samples. Madison Mills, 503 Broadway, New York City.

AMERICAN Military Styles are all the rage in men's tailored to measure suits this season. Easiest to sell; everybody wants them. Far ahead of all others in real class and beauty. Lowest prices,—less than common ready-made suits. Our Agents are coining money. You can earn $10 daily. Send for full particulars, terms and sample book of styles and patterns. American Woolen Mills Co., Dept. 914, Chicago, Ill.

AGENTS Wanted. Get our free sample case offer and start out selling the finest line of soaps, toilet articles and household specialties; goods already in established demand; profits 100% to 140%. We help you build up a big business and are behind you every minute. We guarantee our goods, quality can't be beat. Territories are being grabbed by all the live ones. Write today. Ho-Ro-Co. 109 Locust St., St. Louis, Mo.

YOU can be your own boss with our Key Check outfit. Good for $5 a day stamping names on pocket key checks, fobs, etc. Sample check with your name and address, 15 cents. Pease Die Works, Dept. M., Winchester, N. H.

AGENTS: Big Returns, fast office sellers; particulars and samples free. One Dip Pen Company, 2 Daily Record, Baltimore, Md.

AGENTS Wanted — Economy Kerosene Burners for cooking and heating stoves and furnaces. Big profits. Exclusive territory. Economy Mfg. Co., Dept. D, 616 W. Monroe St., Chicago, Ill.

AGENTS: Big Profits putting up Genuine Gold Leaf Window Letters; Script and 15 other Styles. Chicago Agency Co., 848 Altgeld St., Chicago.

YOU can letter Automobiles, Windows, Trunks, etc., without previous experience, by Transfer Process. Make $27.50 on $2.50 outfit. Auto Monogram Supply Co., 86 Niagara Building, Newark, N. J.

AGENTS! Quick Sales! Big Profits! Outfit free! Cash or credit. Sales in every home for our beautiful Dress Goods, Silks, Hosiery, Underwear and General Dry Goods. Write us today. National Importing & Mfg. Co., Dept. KD, 425 Broadway, New York.

GET our big money maker monogramming Autos, etc., by transfer method. Catalog and particulars free. Motorists' Accessories Co., Mansfield, Ohio.

AGENTS, $50 a week. Will show you how. Genuine Gold Leaf Window Letters. Chicago Agency Co., 842 Altgeld St., Chicago.

$50 WEEKLY and up selling Mexican Diamonds. Exactly resemble genuine; Same Rainbow Fire; Stand tests; sell at sight; Repeat orders. Write quick for Sample Case offer free. Mexican Diamond Importing Co., S. W. Las Cruces, New Mexico.

PAYS Better Than Any Job. Manufacturing High-class Big Selling Advertised Specialties in all lines from my Manufacturer's Guaranteed Formulas. No machinery needed. Smallest Investment required. Dessert Powders, Pancake Flour, Tube Flavors, Catsup, Mustard, Egg-Cono-Me the Pure Food Egg Substitute, Laundry Specialties Marvelle Washing Tablets, Family Soap, Bluing, Medical, Toilet, Household and Automobile Specialties. Stamp brings late lists, valuable information for Profitable Independent Business. Miller, Chemist, Tampa, Florida.

SELL "Tire-Cure." Marvelous; Punctures, cuts, blowouts, permanently repaired in 5 minutes without tools or heat. Self-vulcanizing. Experience unnecessary. Saves 500% vulcanizing bills. $1 outfit repairs 75 punctures. Immense profit. Send for outfit and agency. Money-back guarantee to agents and customers. Eastern Rubber Products Co., Baltimore, Maryland.

AGENTS—Demonstrators—District Managers. Best and fastest selling Sanitary Brushes, Mops, Dusters and New Fibre Brooms. One man's commission $28.00 one day. Four entire sales organizations recently came to us without solicitation from other brush concerns, because they liked our line better. Highest commissions. Stanford Brush Co., 544 W. Lake St., Chicago.

GASTONE Increases Power, Mileage. Eliminates Carbon. One hundred tablets one dollar. Trial convinces. Good agents wanted. Money Maker. Exclusive territory. Write at once. Gastone Company, Maquette, Nebraska.

AGENTS—Specialty Men, Sell Simplex Auto Washer Brushes, new auto and wagon washer—sure, quick cash sales. Free samples. Francis W. Mfg. Co., Harrisburg, Pa.

SELLS like hot cakes. Big profits. New ironing wax also starch. Perfumes clothes lasting violet. Working outfit 5c. Territory given. Marshall Manufacturing, 919 Gates Avenue, Brooklyn, N. Y.

"AGENTS—Good profits for spare time selling Alert High Speed and Ratchet Tap Wrenches, Roller Grip Manndrels and Screw Arbors, Hand Knurling Tools and Boring and Facing Tools."

YOUR name on a Rubber Stamp 12c with address 25c. Central Stamp Works, Newcastle, Ind.

HIGH-GRADE SALESMEN WANTED

$50.00 A WEEK for your spare time. No samples to carry. Sell monogram leather belts from your personal belt. Every man a prospect and our popular price genuine bridle leather belt with stylish monogrammed hammered silver buckle sells easy as rolling off a log. Belt and buckle guaranteed 2 years. Orders filled same day received. Belt complete with monogrammed buckle costs agent $1.00. Sells quickly at $1.50 to $2.00. $1.00 invested today in this beautiful belt for yourself will bring you dividends a thousand fold. Exclusive territory reserved for those who act at once. The Kloth Belt Co., (Fine Belt Makers since 1902.) 406 S. Halsted St., Chicago.

SALESMEN—$12.00 to $30.00 per day selling our E-Z Advertising Tape and Sewing Machine. Every merchant buys. Ad-Lee Novelty Company, 179-P North Michigan Ave., Chicago.

INVESTIGATE immediately the proposition now offered by the National Products Company to responsible and hustling salesmen. They manufacture from Southern Long Leaf Pine the following products: Pinol (Germicide), Pinol (Dandruff Treatment), Pinal (Insecticide), Pinolac (Brushless Auto Varnish), Pinamel (Auto and Furniture Polish), Pinolin (Leather Dressing), also widely advertised Red Snapper Plant Food. Exclusive territory and liberal commissions. Call on druggists, barber shops, furniture stores, hardware stores, garages and florists. For full information address National Products Company, Gen. Sales Office, Eau Claire, Wis.

ANTI-BLEEDING Cotton, stops bleeding. District Manager wanted. Galvo Manufacturing, 1386 East Fortieth, Cleveland, Ohio.

SALESMEN Wanted to sell Electric Cigar Lighters and Moisteners. Salary or commission. You carry stock or we ship direct. Write for special offer. Drake Mfg. Co., 221 Grand, Milwaukee, Wisc.

SALESMEN: — Calling on blacksmith trade, investigate our new tool for a side line. Western Boiler Pipe Company, Monmouth, Illinois.

SALESMEN—To place small orders of $6.65 in country stores as a side line; commission $1.15. Dr. B. J. Cline, Pagar Bluff, Mo.

SALESMAN: Energetic Man to Handle Our Line of Advertising and Calendar Pencils, Good Commissions, Advances Made on Sales. Address: Peerless Pencil Co., Louisville, Ky.

YOUNG men everywhere as Salesmen and District Managers. $25-$50 weekly. New Brush Co., Hartford, Conn.

SALESMEN—City or Traveling. Experience unnecessary. Send for list of openings and full particulars. Prepare in spare time to earn the big salaries—$[illegible] to $10,000 a year. Employment service rendered members. National Salesmen's Training Ass'n, Dept. 125-G, Chicago, Ill.

MEN who can finance $500 [illegible] in each district to represent [illegible] from factory, guaranteed to [illegible] and close punctures. Big profits. [illegible] Vandeventer Ave., St. Louis, Mo.

SALESMAN of ability wanted for exclusive territory to sell a Perfect Belt Lubricant direct to manufacturers. Our commission guarantees a sure income. American Lubricant Works, St. Louis, Mo.

WANTED—Salesman calling on Hardware, Dry Goods and Department Stores, to handle as side line the Playette Baby Swing; large sellers; big commissions. Address for further information, The Valley Supply Co., Manufacturers, St. Louis, Mo.

NEW Advertising Side Line Specialty; will earn you $5 to $10 daily; quick seller; sure repeater. Small pocket outfit. G. Furlong, 711 S. Dearborn, Chicago.

SALESMAN Wanted — Splendid opportunity to earn $3,000 to $5,000 per year representing large Correspondence School; this is a bona fide proposition. Previous experience valuable; first-class references required regarding character and ability; exclusive territory open to right man or woman. L. S. Smith, Federal School of Commercial Designing, Minneapolis, Minn.

FOR Salesmen calling department stores have excellent side line. Box 201, Hartford, Conn.

SALESMEN—Side-line sewing machine oil; practically every store buys it; good commission; free sample; weighs three ounces. The King Company, Rockford, Illinois.

TRAVELING Salesman desires to represent manufacturer on coast. Write me today. Rocker, 361 Third Avenue, San Francisco.

$40 TO $100 a week. Free Samples. Gold Sign Letters anyone can put on windows. Big demand. Liberal offer to general agents. Metallic Letter Co., 431E N. Clark St., Chicago.

SALESMEN to Sell Grocers—The Store-Helps Pricing Systems; thoroughly modern and a good seller. They are absolutely necessary in a retail grocery store and you can sell every grocer and make $2.55 on each No. 1 Outfit. We pay commissions promptly. Pocket samples. Store-Helps Mfg. Co., Federal Life Bldg., Chicago.

TWO Hundred Dollar Guaranteed Phonograph Outfit sent on approval for $74.50. Seventeen dollars' worth records, and two dollars' worth needles free. Fifty dollars a week taking orders from this sample. Write for particulars. Play All Phonograph Makers, 516 So. Wabash Avenue, Chicago.

FURNACE Oil Burners, Ford Nonkicks, Seneca Filters. E. L. Miller Mfg. Co., Kansas City, Mo.

SALESMEN, Energetic, to visit schools; $100 salary and liberal commission. R. O. Evans & Co., 1109 L. Wabash Ave., Chicago.

SALESMEN Wanted to sell the most practical oiler ever made for the springs of automobiles and trucks. Small sample. Big profits. Write today. Van Spring Oiler Co., 222 N. Wabash Ave., Chicago.

SIDE Line Salesmen. Six samples hand made mailing envelopes. Sell to banks, financial institutions, city and county officials, abstractors and mortgage houses. Big commissions daily and big repeats. C. E. Hunt & Co., Est. 1911, 17 E. 22nd, Chicago.

REPRESENTATIVE Wanted — We want an aggressive man to devote whole or part time on substantial, dignified, high-class proposition. Every steam plant a prospect. Every order means a repeat. Address Dept. H, 1759 Monadnock Blk., Chicago.

SIDE Line—Something new. 400% profit. Every Business, Professional Man must use it up continuously. Retails $5.00, your profit $4.00. Quick sales. Instant re-orders. Secretary, Drawer 596, Hartford, Conn.

CALIFORNIA Rosebeads selling like hot cakes. Agents coining money. Absolutely new. Big profits. Catalog free. Mission Bead Company, SP2819 West Pico, Los Angeles.

FASTEST Selling Advertising Specialty Made. Your customers—why not sell them. Best side line yet. Look us up, then write C. E. Erickson & Co., 202 Erickson Bldg., Des Moines, Iowa.

WERE You Ever Offered a Grocery Store? Our Proposition is Better. Let us tell you how you can handle Flour, Canned Goods, Provisions, an entire line of groceries, as well as Paints, Roofing, Stock Food, Automobile and Machinery Oils and Greases. No rent to pay. No investment in stock. Large orders taken from samples. Goods of guaranteed and proven quality. Selling experience not necessary. Very profitable work for "workers." Address Hitchcock Hill Co., Dept. 200, Chicago, Ill. References: Any Bank or express company.

80 PER CENT commission to exclusive state sales managers, representing us in one of the states which are still open east of the Rocky Mountains, with the exception of Ohio, Indiana and Kentucky. You must carry supplies, nothing less than $350, wholesale price, for immediate delivery through your salesmen to your customers. This is a big proposition and an unlimited field if you get on the ground floor; will stand strictest investigation and a business second to none. General Sales Manager, U. C. Association, 1028-31 Black Bldg., Los Angeles, Cal.

SALESMEN—Become independent — own your business, experience unnecessary—selling our $6,000 Accident, Death, $30.00 Accident, $25.00 Sick Weekly Benefits, $10.50 yearly, half amounts, $5.50. Guaranteed steady income from renewals. $250,000 deposited Insurance Department. Registration Dept. P, Newark, N. J.

HELP WANTED

INVENTORS—Send sketch of your invention for advice regarding patent protection. Twenty Years' Experience. Handbook on Patents sent Free. Talbert & Talbert, Patent Lawyers, 4102 Talbert Bldg., Washington, D. C.

AMERICAN Citizens, 18 to 60, including women, investigate immediately your rights to Government employment. Let me send you Form RK 2026 for free advice. Earl Hopkins, Washington, D. C.

WIDE Awake Man to take charge of our Local Trade. $4.00 to $5.00 a day steady. No experience required; pay starts at once. Write today. American Products Co., 595 American Bldg., Cincinnati, O.

COLUMBIA School of Correspondence, Washington, D. C., prepares for Commissions in Army, Navy, and Marine Corps, also for entrance to West Point and Annapolis. There are also Civil Service and High-School Courses. Send now for leaflets. Edward L. Comegys, Prin., Kenois Building, Room 413.

$20 TO $35 per month to any employed men and women, without interfering with regular work. No selling, no canvassing, positively no investment. Northwestern Silver Company, St. Paul, Minn.

PHOTOPLAYS in demand. Make extra money. We show you how. Details free. Rex Publishers, Box 175, H-39, Chicago.

WANTED Immediately — Railway Mail Clerks. $92 month. List positions free. Franklin Institute, Dept. F21, Rochester, N. Y.

BUSINESS Worthwhile. I Start You silvering mirrors, Plating tableware; Plans Free. Clarence Sprinkle, Dept. 28, Marion, Indiana.

HOMEWORKERS on Small Scale. Manufacturers on large scale wanted, to make Toy Soldiers, Army, Navy, Marines, Cannons, Machine Guns and other toys and novelties. This new American Industry stands out conspicuously since the war stopped all importation of German toys. Greatest chance for industrious people for an independent business. Some people started small, own factories now. Fortunes are made in toys. Enormous demand and future in "American Made Toys." Millions needed this year. We buy these goods all year, paying fixed prices. Experience or tools not necessary. Hundred and more made complete per hour. Castingform outfits $3.00 up. Booklet and information free. Toy Soldier Manufacturing Company, 32 Union Square, New York.

RAILWAY Mail Clerks Wanted. Men—Women 18 to 35. $1,100 first year. List positions free. Franklin Institute Dept. F21, Rochester, N. Y.

FIREMEN, Brakemen, Baggagemen, $110-$200. Colored Porters, by railroads everywhere. Experience unnecessary. 810 Ry. Bureau, East St. Louis, Ills.

GOVERNMENT Wants Railway Mail Clerks. Men—Women. $1,100 first year. List positions free. Franklin Institute. Dept. F21, Rochester, N. Y.

EARN While Learning—Auto Driving, Repairing, Electrical Systems, Tractors, Acetylene and Electric Welding, Tire Vulcanizing. Classes now forming. Write today. Crown Auto School, Inc., 15 Willis Ave., West Detroit, Mich.

U. S. GOVERNMENT Wants Railway Mail Clerks. Men—Women 18 to 35. $1,100 first year. Permanent Positions. List Government positions free. Franklin Institute, Dept. F21, Rochester, N. Y.

MEN—Women wanted for permanent Government positions. $1,000-$1,800. Many good openings. C. J. Ozment, Civil Service Specialist conducted examinations. Just write Ozment, 101, St. Louis.

WANTED Immediately, Men—Women, 18 or over. Hundreds Government Jobs now obtainable. $1,000-$1,100 first year. Quick raise. Common education sufficient. List positions free. Write Franklin Institute, Dept. F21, Rochester, N. Y.

MONEY in Candy. See our add under Business Opportunities. Dept. M16, Southern Praline Co., New Orleans, La.

GOOD Prices paid for butterflies, insects. See Sinclair's Display advertisement on page 16.

FIREMEN, Brakemen, $150-$200 monthly, all railroads, everywhere, experience unnecessary, send stamp, Railway Association, Dept. C, Brooklyn, N. Y.

WANTED—Tool and die makers for steady employment in Chicago district. Give age, experience and references. Address M. N., Room 925, 78 E. Madison St., Chicago.

CIVIL Service Examinations, held within short notice. Prepare now. Clerk, Carrier, Rural Carrier, Railway Mail Clerk, Postmaster, P. O. Inspector, Government Clerk and Stenographer. Monroe Correspondence School, 21 Hubbell Pk., Rochester, N. Y. Particulars free.

GOVERNMENT Positions are Desirable. Prepare for Railway Mail, Post Office, Rural Carrier, Customs-Internal Revenue, Departmental, Immigration and other branches through our expert, former Government Examiner. Write for free booklet giving full information about these positions and our Money-Back Guarantee Contract. Patterson Civil Service School, Box 4025, Rochester, N. Y.

INVENTORS desiring to secure patents should write for our book, "How to Get Your Patent," tells our terms and methods. Send sketch for our opinion of its patentable nature. Randolph & Co., Patent Attorneys, 620 F, Washington, D. C.

SEND $2.00 for a book of unequaled merit, comprising self-instruction courses in civil service covering federal, state and municipal service. Money back if not satisfied. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago, Ill.

GOVERNMENT Examinations. Most thorough preparation, $5; returned if not appointed; particulars free. American Civil Service School, Washington, D. C.

OUR genuine gold window sign letters are an excellent money-making proposition for handy men. Slann Sign System, 1579 Antoine, Detroit, Mich.

WRITE Articles, stories, news, in spare time for newspapers and magazines. Big pay. Copyright book Free. Press Syndicate, 553, St. Louis, Mo.

MAKE money writing Photo-plays; details free to beginners. No correspondence course. Producers' League, 230 Wainwright, St. Louis.

BE a Mirror Expert. Good income; spare time home at first; no capital; we train, start you making and silvering mirrors; French method. Free prospectus. W. P. Derr, Pres., 579 Decatur St., Brooklyn, N. Y.

TO MANUFACTURERS

MANUFACTURERS who manufacture Cooking Utensils and Stamped Metal Goods, write C. O. Reynolds, 1931 Hall Ave., Huntington, W. Va.

FOR ADVERTISERS

STOCK Cuts—For Dry Goods, Furniture, Shoes, Housefurnishings, Men's and Women's Wear. Catalogs Free. Syndicate Electrotyping Co., 16 East 23rd St., New York.

ADVERTISE in 400 Weeklies. Central states, $2.75 line, entire list. Lloyd Bowers, 219 S. Dearborn, Chicago.

SPECIAL! Page 8½x11 display advertisement 100 magazines thrice, $111.00. Wood's Popular Service, Atlantic City.

SPECIAL! 1,000 co-publishers wanted. Particulars 15c. Globe Syndicate, Atlantic City.

ADVERTISE—25 words in ninety different country weeklies, $2; in ten Sunday papers, $2.50; in 100 monthlies, $1.00; lists free. Stanford Agency, Canonsburg, Pa.

ILLUSTRATE Your Add with a Drawing. Dexter's Designs, Princeton, N. J.

INCREASE your sales. Place your proposition before the readers of "Cartoons Magazine," 32,000 copies every month. Classified rate only 5c per word. Mail in a trial ad today. Cartoons Classified Dept., 78 E. Madison St., Chicago.

AGENCIES WANTED

CAMERON BROS., P. O. Box 52, Wellington, New Zealand. Indent agents.

LETTER SPECIALISTS

100 SUCCESSFUL Sales Letters prepared by "America's Leading Advertising Authority." Complete copy of this copyright book mailed for only $1.00 while they last. Stephens-Wetzel, Pub., Box 101, Madison Square, New York City.

"LETTERS that invigorate your business." Write Earl W. Hodgkins, Woodsville, N. H.

MAKE Your Advertising Talk. Sales letters $1. Booklets $10 up. Jacobus Advertising Service, 1073 Sanford Ave., Irvington, N. J.

SALES Engineer Poag writes letters, booklets, folders that sell things. Write for evidence today! 708 Brandywine, Schenectady, N. Y.

BUSINESS SERVICE

INCORPORATE. Our lawyers do the work, saving you time, annoyance and money in incorporating under the most liberal laws of Arizona. Laws and forms free. Southwestern Securities & Investment Co., Box D488, Phoenix, Ariz.

FOR OFFICE AND FACTORY

BE Neat—Keep your cuffs clean! Save your shirts, wear Sherlan Black Sateen Oversleeves. Look businesslike, very durable. Send 35c for sample pair and our catalog of work clothing. Stamps accepted. Sherlan Mfg Co., Dept. P., 1031 Dakin Street, Chicago, Illinois.

TYPEWRITERS AND SUPPLIES

UNDERWOODS, Olivers, Remingtons, $15 to $45; terms to suit; free trial. Typewriter Co., 193 N. Dearborn, Chicago.

UNDERWOODS rebuilt, guaranteed one year, $40 and up. Ribbons, all colors, any machine, 3 for $2. R. V. Johnson Co., 20 E. Jackson Blvd., Chicago.

HIGH grade typewriter ribbons and carbon paper at money saving prices. Send for list. Cowle Co., 1400 H Street, Washington, D. C.

ALL makes. Lowest prices, $10.00 to $60.00. 15 days Free Trial. Catalogue and terms mailed on request. Henry Typewriter Company, 217 West 125th St., New York City.

LARGEST Stock of Typewriters in America. Underwoods (rebuilt) way under manufacturer's prices; rented anywhere, applying rent on purchase price. Free trial. Installment payments if desired. Write for catalogue 70. Typewriter Emporium, estab. 1892, 34-36 W. Lake St., Chicago, Illinois.

STARTLING Values in Typewriters, $10 to $15 up. Factory rebuilt. All makes. Shipped on trial. Write for our special offer No. 226-F. Whitehead Typewriter Co., 186 North La Salle St., Chicago.

TYPEWRITER Ribbons Renewed last double time. One 20c coin. Three 55c. Six $1.00. Twelve $1.80. No checks. Ribbon Co., Gautier, Miss.

ADDING MACHINES

"EASY Figures" Calculator Adds, Subtracts, Multiplies, Divides, Squares and Cubes. No mistakes. Answers instantly. One 15c, two 25c (coin). Agents make $20.00 week. Curtis Co., Davies Building, Dayton, Ohio.

NEW $2.50 Adder. Adds; subtracts; multiplies, whole numbers, decimals, fractions; quick as a flash. Absolutely accurate. Fully guaranteed. Capacity $999,999.99 Over 55,000 users. Makes adding easy for anyone. Bassett Co., 1458-Y Hollywood Ave., Chicago.

WONDERFUL Adding Machine, seven columns capacity, only one dollar. Adds and multiplies as fast as the fingers will move. Thousands being sold through demonstration. L. J. Leishman Co., Dept. Q, Ogden, Utah.

ROPP'S Calculator and Short-Cut Arithmetic—Shows the answer as quickly as a watch shows the time to all problems likely to occur in office, store, shop, bank, farm or factory. Over two million sold. Price, vest pocket size, 50 cents; leather, pocket size, $1.00. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

DUPLICATORS AND DEVICES

A DUPLICATOR $1.00. Letter size. Make over fifty copies from pen or typewritten original. Send for circulars. Scientek Laboratories, Dept. 1, Madison, Maine.

"MODERN" Duplicator—a Business Getter, $1.50 up, 50 to 75 copies from pen, pencil, typewriter; no glue or gelatin. 35,000 firms use it. 30 days' trial. You need one. Booklet Free. J. E. Durkin & Reeves Company, Pittsburgh, Pa.

"QUICK Process Duplicators." Makes 100 copies in 10 minutes. Remarkable time-savers. Thousands in use. Write for free illustrated circular. Heyer Duplicator Co., 160-PM, N. Wells St., Chicago.

TELEPHONE APPLIANCES

CONVENIENT and efficient device. Phone hands free. Particulars dime. Kallajian Telephone Holder, Boston, Mass.

MAILING LISTS

150 LIVE Agents' inquiries just received from high-grade advertising. This (guaranteed 1919) list $1.00. Name Service, 350 South Figueroa, Los Angeles.

AGENTS, Automobile Owners, etc. $2.00 per thousand. The Rightquick Publicity Bureau, 1314 Arch Street, Philadelphia, Pa.

LIST Iowa Car Owners, $1.00, 1,000; $7.50, 10,000. State Supply Co., Cedar Rapids, Iowa.

1919 AGENTS' or Opportunity Seekers' Letters Rented $1.00 per 100. 100 Typewritten Addresses $1.00. Louis Irons, Terre Haute, Ind.

1919 AGENTS, thousand $7.00; 1918, $5.00. Conrad Company, Altoona, Pa.

PRINTING, ENGRAVING AND MULTIGRAPHING

5,000 LOTS colored bond circulars, 5½x8½, $6.75; 8½x11, $11.25; envelope slips, $4.00. Samples. Good's Printery, Harrisonburg, Va.

SEND for Large Catalog of Attractive Gummed Labels and Advertising Stickers. Royal Label Co., 27 South 7th, Philadelphia.

200 8½x11 HAMMERMILL bond letterheads $1.00 postpaid. Race Printery, Hudson, N. Y.

REDUCE your printing expense. Our pre-used outfit offers the opportunity. Box 332B, Watertown, S. D.

CIRCULARS, 1,000 3x6, $1.00; 4½x6, $1.35; 6x9, $2.25. Jupter, Lancaster, Ohio.

100 BOND Letterheads and Envelopes, $1.25 Postpaid. Garland Miller, Trimble, Ohio.

QUALITY Printing Prepaid—500 either noteheads, statements, cards, $1.75. 500 6¾ envelopes $2.00, letterheads $2.40. Samples free. Scarbrough Co., Kerens, Texas.

1000 HIGH Grade business cards and case, $1.60. Samples. Specialty Print Shop, 10 Hawker, Dayton, Ohio.

125 TWO color Bond Letterheads, 125 Envelopes $1.50. Economic Specialty Co., Leonia, N. J.

ADDRESS Cards—100 with attractive cardcase 50 cents. Barker Press, 17 Gibson Street, Medford, Mass.

250 ENVELOPES $1.35, 250 bills $1.35, 250 cards $1.00. Hummel, 2832 N. Mervine, Philadelphia.

500 BOND Letterheads—2 colors—$3.00 postpaid. Ad-Builders, 1857 Holly, Kansas City, Mo.

RUBBER Stamps!!! Gummed Labels!!! Samples Free!!! Edward Harrison, "Printing," Baltimore.

GOOD Printing, Low Prices! Catalogue and samples free. D. Lomond Engraving Co., 65 Broadway, Brooklyn, N. Y.

SAVE ½ on high-grade printing prepaid anywhere. Samples, list. Ballou Printing Co., Columbus, Nebr.

QUALITY Printing—1,000 either envelopes, noteheads, cards, statements, $2.50 prepaid. Stamp brings samples, everything. Model Company, Manchester, Iowa.

RECORD "Stick Tight" Gummed Labels and Advertising Stickers for all purposes. Let us quote on your next supply. Record Labels, Box M-257, Newark, N. J.

WE print anything. Cuts made from photograph. Samples. Commercial Press, Batavia, Ohio.

LETTERHEADS, Envelopes, $2.00 thousand. Better stock little higher, a price to suit. Samples free. Quality Print Shop, Marietta, Ohio.

GOOD Printing at low prices. 1,000 good letterheads, envelopes, cards, billheads, labels, circulars, $2.75 to $3.50. Samples free. Catalogues, booklets and circulars our specialty. Ernest L. Fantus Co., 523 S. Dearborn St., Chicago.

PRINTING Outfits—Presses, type, supplies, type novelties. Send stamp for catalogue. Mode' Press, York, Penna.

BEAUTIFUL Lithographed Stationery at Printers' Prices; Small quantities. Kay-Dee Lithographing Co., 764 Teutonia, Milwaukee.

POSTERS—Imitation Lithographs, Billboard Signs, Circus, Theatrical, Motion. "Runey" Cincinnati.

FOR MEN

SHAVE without water, soap or brush. Lewis' Shave-Ezee-Creme gives a delightful shave and a soothed, comfortable feeling to the skin. Softens toughest beard. A true cream used on a dry face. Positively no water used. Protects skin from sun and wind. Gives soldiers comfort. 6-oz. jar mailed anywhere, 52c. Dealers wanted. No samples. The Kreem-Eze Co., Roseville, Cal.

TOBACCO for Sale. Homegrown, Chewing or Smoking. Lb. 50c postpaid. Randolph Tobacco Farm, Paducah, Kentucky.

RAZORS AND BLADES SHARPENED

"SMOOTH Shave" Safety Blade Sharpening. Walton Process renews edge. 3c dozen. Enclose coins and 3c stamp for postage. Prompt service. Walton, 28 Cornhill, Boston, Mass.

TWO safety razor blades resharpened free to new customers, or 30c dozen. A wonderful five hundred dollar machine. Scandia Manufacturing Company, Regent Building, Boston, Mass.

RAZOR Blades sharpened right. Single edge 2½ cents, double edge 3½ cents. Keenedge Shop, 7 South 10th, Philadelphia, Pa.

BLADES Sharpened better than new, 3c each. "Tuttledge," Indianapolis, Ind.

GUNS, SPORTING GOODS, ETC.

GOIN' Fishin'? Make sure of big catch. Our Guaranteed Bait does the work. Big free. Agents wanted. Write Western Mfg. Co., 120 Hannibal, Mo.

BUY, sell, exchange old-time and modern Fire-arms. Antiques wanted. Stephen Van Rensselaer, 805 Madison Ave., New York.

BOATS AND LAUNCHES

DARROWS Steel Boats, sold finished, knock down or patterns. Catalog 15¢ models. Darrow Boat Co., Albion, Mich.

DIAMONDS, WATCHES AND JEWELRY

SIXTY-FOUR pages, plum full of bargains, that's our new catalog. Just off the press. Instructive, like a text book. More interesting than a serial story—but, the get a copy and see for yourself. New "Peace Year" prices on jewelry. We have knocked the props from under "profiteering" in jewelry. Our price-cutting power has created extraordinary bargains in Watches, Wrist Watches, Rings, Diamonds, Clocks, etc. Think of getting a $45.00 (regular value) Diamond (Tiffany Mounting) Ring for $23.50; Leonard Wrist Watch at $18 and Faultless Fountain Pen at $1.25. That's only a sample of the hundreds of savings we offer in our New Special Catalog. Write for a copy today. David Stern Company, 618 Davsco Bldg., 1027-29 Madison St., Chicago.

$3.00, $10.00, $15.00. WE buy second hand watches. Seven, fifteen and seventeen jewelled grades, $5.00, $10.00 and $15.00. They are used for our foreign trade. We also want old watches for the movement parts to use in our repair and material department. We report the same day watches are received. Send your watch today. Rogers Thurman & Co., Jewelers' Wholesale Supply House, Established 30 years. Dept. 203 Mallers Bldg., Chicago, Ill.

DAZZLING Tokar Diamond Rings. Ladies' Tiffany solid gold-welded mountings 79c prepaid. R. Harrison, 105 W. [illegible] St., Evansville, Ind.

FOR THE HOME

REPAIR your own Cook or Heating stove. We supply burned-out parts for any make. Information free. Kerwin Supply House, 650 Aldine Ave., Chicago.

MISSION Furniture—Make your own at little expense. Complete instructions, working drawings and stock lists for 96 different pieces. Price $1.50 postpaid for set of three books. Send for complete descriptive matter. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

HONEY

I HAVE about half a car of very nice clover honey, left with me for sale at once. This honey is thoroughly ripened, rich and fine flavored and will be sold as long as it lasts at 26 cents per lb. in 30 lb. cans. M. V. Facey, Preston, Minn.

FOOD PRODUCTS

FRESH Eggs, 12 doz. or more, 39c doz., no charge for the case; cash with order. E. C. Colby, Crystal Lake, Ill.

PHONOGRAPHS, RECORDS, NEEDLES

THREE amazing talking machine offers. Don't send a penny. Seeing is believing, so just mail your order and any of the following wonderful values will be shipped to you the same day C. O. D. with privilege of examination. First, regular $7.50 model S-t-e-w-a-r-t, our price $5.90. You know the little Stewart is in a class by itself. Second, the marvelous M-a-g-n-i-p-h-o-n-e table machine, our price $14.95. You'll find real satisfaction in a Magniphone. Third, genuine exquisite S-i-l-v-e-r-t-o-n-e, $50.00 model in real Mahogany-Sheraton design cabinet machine, 38½ in. high, our price $32.50. A word to the wise is sufficient on the Silvertone. We have a good supply of the above machines on hand but order now, don't delay. In line with our well established policy of a square deal to all and to give widest distribution to these bargains, no more than one machine will be shipped to a customer. Important Notice: Every machine in original box or crate from factory. Order direct from here. David Stern Company, 1027-1029 Madison St. (In business since 1885), Chicago, U. S. A.

SPECIAL Bargain Catalogue just out. Records, Phonographs and parts, new and used. Write today. Benjamin Chimberoff, 3352 W. Polk St., Chicago, Ill.

PHONOGRAPH Owners. Test our wonderful, new, Ring Point needles. Buy at wholesale prices and make money selling to your friends who hear how they improve tone. Scientific method, important discovery, very interesting. Single needle plays 100 records. Send 25c for samples and special offer. D. Kenyon Co., 31 Union Square, New York.

FOR Sale: Wilsonola and fifty records, used two years, $250. Box 135, Amboy, Ind.

ATTACHMENTS for All Phonographs. Pla-More Phonograph Specialties, 21 E. Van Buren, Chicago.

DON'T destroy old or worn Phonograph Records. Send three dimes for bottle of Record Renewer that treats 25 records. Stops scratching and brings back the tone. Record Chemical Co., West Mansfield, Ohio.

BUILD Phonographs, we furnish motors, tonearms, cabinet material and blue prints, 3 cent stamp for catalog. Belltona Company, Oliver St., N. Tonawanda, N. Y.

BUILD your Phonograph. "Perfection" high quality spring and electric Motors, Tone Arms, Reproducers. Wonderful results. Big saving. New catalog and building instructions mailed for ten cents. Indiana Phonograph Supply Co., Indianapolis, Indiana.

BUILD Your Own Phonograph. Big saving. Pleasant instructive work. Complete instructions, blue-prints, etc., absolutely free. Write today. Associated Phonograph Co., Dept P., Cincinnati, Ohio.

MUSIC AND MUSICAL INSTRUMENTS

"WHY Must We Say Good-bye?" Latest song hit; piano, 15c; orchestra, 25c. The Victory Liberty Loan March; piano, 15c; orchestra, 40c; band, 40c. Aviation "Waltzes," piano, 25c; orchestra, 80c. The Home-Coming March and One-Step; piano, 15c; band, 40c; orchestra, 40c. Hildreth & Beck, Dept. C, Freeport, N. Y.

HAWAIIAN made Koa wood ukuleles and steel guitars. Agents wanted in every city and town of the United States. Free trial on samples sent on consignment. Write today and be first. Kamaka Ukulele and Guitar Works, 1039 E. 5th Ave., Honolulu, Hawaii.

SONG Writers: You cannot afford to miss our proposition. Reference, any bank or first-class sheet music house. Warner C. Williams & Co., Dept. P., Indianapolis, Ind.

SONG Writers: Let me help you. Best service. Lowest prices. Valuable information free. Hummel Studios, Clarence Bldg., Cleveland, O.

PIANO by Ear. If you have musical talent, write for Free booklet. Niagara School of Music, Niagara Falls, New York.

PATENT ATTORNEYS

PROTECT Your Rights—Write for "Record of Invention" which contains forms to establish evidence of conception of your invention. Prompt personal service. Preliminary advice without charge. J. Reaney Kelly, 732-A Woodward Bldg., Washington, D. C.

DON'T Lose Your Rights. Send for blank form "Evidence of Conception" to be signed and witnessed. Establish your rights before disclosing your invention to anyone. Form and information concerning patents free. Lancaster & Allwine, 221 Ouray Bldg., Washington, D. C.

MONROE MILLER, Ouray Building, Washington, D. C., Patent Attorney, Mechanical and Electrical Expert. Best quality of work and results. Moderate charges. Advice free.

INVENTIONS Patented, Trade-Marks Registered, Labels, Prints and Publications Copyrighted, reasonable fees, correspondence solicited, detailed information free, booklets. Jaynes & Jaynes, 700 Kellogg, Wasnington, D. C.

THE Patentome is free. An education in obtaining patents. Established 1865. Anderson & Son, Attorneys, 707 7th St., Washington, D. C.

PATENT What You Invent. It may be valuable. Write me. No attorney's fee until patent is allowed. Estab. 1882. "Inventor's Guide" Free. Franklin H. Hough, 522 Loan & Trust Bldg., Washington, D. C.

PATENT Applications filed on partial payment plan. We help sell the patent. Trade-marks, copyrights, etc. Milo B. Stevens & Co., 685 F St., Washington, 353 Monadnock Blk., Chicago. Estab. 1864.

KEEP up with Progress. Promote your patent. Send 50c for year's subscription to best inventors' magazine. "Invention and Manufacturing," American Industries, Inc., Washington, D. C.

PATENTS, trade-marks, copyrights. Write for our free book of Patent information. Beale & Park, 1423 F St., Washington, D. C.

PATENT Buyers' names free on request. Patent News—d, Washington, D. C.

INVENTORS—Send sketch of your invention for advice regarding patent protection. Twenty Years' Experience. Handbook on Patents sent Free. Talbert & Talbert, Patent Lawyers, 4622 Talbert Bldg., Washington, D. C.

PATENTS promptly procured. Send drawings for actual search of U. S. patents. Personal service. Moderate fees. Write for free patent book. George P. Kimmel, Patent Lawyer, 54-U, Loan & Trust Bldg., Washington, D. C.

PATENTS promptly procured. Send drawings for actual search of U. S. patents. Personal service. Moderate fees. Write for free patent book. George P. Kimmel, Patent Lawyer, 54-U, Loan & Trust Bldg., Washington, D. C.

THOROUGH Personal Service obtaining Patents, Trade Marks, etc. All communications strictly confidential. Inquiries invited. Moderate terms. Frank Ledermann, Registered Attorney and Engineer, 21 Park Row, New York.

LACEY Patent-Sense. See page 156.

"INVENTOR'S Adviser" sent free on request. Be sure you understand about manufacture, importation and the Compulsory License Clause of the Patent Act before applying for Canadian Patents. Marion and Marion, 361 University Street, Montreal, Canada, and 918 F Street, Washington, D. C.

PATENTS. Booklet free. Highest references. Best results. Promptness assured. Send model or drawing for preliminary examination. Watson E. Coleman, Patent Lawyer, 624 F Street, Washington, D. C.

PATENTS Procured. Trade marks registered. A comprehensive, experienced, prompt service for the protection and development of your ideas. Preliminary advice gladly furnished without charge. Booklet of information and form for disclosing idea free on request. Richard B. Owen, 30 Owen Bldg., Washington, D. C., or 2276-R Woolworth Bldg., New York.

PATENTS procured; reliable service; "The Last Word on Patents" sent Free; every inventor should have a copy. Sanders, 7 Webster Building, Chicago.

PATENTS — Trademarks — Write for our free illustrated guide book, "How To Obtain a Patent." Send model or sketch and description and we will give our opinion of its patentable nature free. Highest references. Prompt attention. Reasonable terms. Victor J. Evans & Co., 166 Ninth, Washington, D. C.

PATENTS—Herbert Jenner, patent attorney and mechanical expert, 622 F. St., Washington, D. C. I report free of charge if a patent can be had and its exact cost. Send for circular.

FOR INVENTORS

INVENTORS—Send sketch of your invention for advice regarding patent protection. Twenty Years' Experience. Handbook on Patents sent Free. Talbert & Talbert, Patent Lawyers, 4280 Talbert Bldg., Washington, D. C.

INVENTIONS—How to protect, sell and buy them. If you are inventive, read this book. 108 pages, 25c, postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

FOR eighteen years we have specialized in manufacturing new patented articles. We make models, dies and do experimental work. Modern Tool & Manufacturing Company, 119-121 Opera Place, Cincinnati, Ohio.

PATENT Buyers' names free on request. Patent News—g, Washington, D. C.

PATENTS. If you have an invention which you wish to patent you can write fully and freely to Munn & Co. for advice in regard to the best way of obtaining protection. Please send sketches or a model of your invention and a description of the device, explaining its operation. All communications are strictly confidential. Our vast practice, extending over a period of seventy years, enables us in many cases to advise in regard to patentability without any expense to the client. Our Hand-Book on Patents is sent free on request. This explains our methods, terms, etc., in regard to Patents, Trade Marks, Foreign Patents, etc. "Scientific American" contains Patent Office Notes, Decisions of interest to inventors, and particulars of recently patented inventions. Munn & Co., Solicitors of Patents, 623 Woolworth Building, New York, and 625 F Street, Washington, D. C.

PATENTS Procured—Trade Marks Registered — A comprehensive, experienced, prompt service for the protection and development of your ideas. Preliminary advice gladly furnished without charge. Booklet of information and form for disclosing idea free on request. Richard B. Owen, 30 Owen Bldg., Washington, D. C., or 2276-R Woolworth Bldg., New York.

INVENTORS, send sketch or model of your invention, for opinion concerning patentable nature. Book, "How to Obtain a Patent," sent free. Gives information on patent procedure and tells what every inventor should know. Established twenty-five years. Chandlee & Chandlee, 408 Seventh St., N. W., Washington, D. C.

600 MECHANICAL Movements, also illustrations and explanations of 50 perpetual motions. My book Inventors' Universal Educator, 4th edition, tells how to procure and sell a patent for your new invention. Government and other costs. Covers the matter from A to Z. 140 pages elegantly bound. Contains noted Court decisions on Patent cases. Mechanical Movements greatly assist inventors — suggest new ideas that might prove of great aid in perfecting inventions. Tells how to select an attorney. Has valuable information regarding Patent Sharks, Selling agents and Brokers. Price $1. Postage free. Fred G. Dieterich, 621 Ouray Building, Washington, D. C.

SPECIALISTS in the development, manufacture and sale of new devices. A finely equipped factory and a capable and experienced organization at your service. Detroit Accessories Corp'n, Gratiot and Fisher Avenues, Detroit, Michigan.

PATENTS. Write for free illustrated guide book. Send model or sketch and description for free opinion of its patentable nature. Highest references. Prompt attention. Reasonable terms. Victor J. Evans & Co., 157 Ninth, Washington, D. C.

HAVE You an Invention? If so, write for our free book, "How to Get Your Patent," tells our terms and methods. Send model or sketch for our opinion of its patentable nature. Randolph & Co., Dept. 144, Washington, D. C.

PATENTS FOR SALE

EVERY Carpenter and carpenter foreman will want a tape line ring that will hold tape while measurement is read. Does not require an extra man to hold ring. Cheap to manufacture. For sale outright. Harry Rand, Westville, New Jersey.

"DOG Foot Brace." Practical, inexpensive. Good investment. Emma Craven, 948 Clinton St., Portland, Oregon.

WANTED a partner to pay foreign patent fees on a useful household invention, for half interest. Also for sale foreign and home territory. Burton W. Allis, Garnett, Kans.

PATENTS for sale: To buy or sell patents address, Patent News—P, Washington, D. C.

POCKET Phonograph. U. S. and Canadian territory for sale. Can be made for a dime. Sells for a dollar. Excellent for premium, advertising or entertainment. H. H. Pratley, 231 Smith St., Winnipeg. No samples sent.

PATENT For sale of 10c article salable by 100,000 stores. Small capital sufficient. Culver, Gautier, Miss.

DOOR Lock patent for commercial bodies for sale or lease on royalty. None better. Samuel Gehret, York, Pa.

FOR Sale! Patent No. 1234775. A simple attachment for sleigh or baby cutter on bare sidewalks. For particulars, write Chas. R. Kuster, Jr., 564 West Third St., Fulton, New York.

FOR Sale! Outright or royalty. My U. S. Patent—rail brake 1273212—patent pending in Canada. Also Rail Joint U. S. Patent pending, a "can't sag rail." If interested, write for particulars. Otto Freemark, Martin, Ohio.

BUILDERS and Manufacturers make offer for U. S. Patent. Throat-lining and damper for fireplaces. Steel or firebrick. Particulars free. I. Unworth, 65 Glendale Ave., Hamilton, Ont.

PATENT No. 1290866 for sale. Thermostatic circuit closer. Best offer takes it. M. F. Arias, 105 Fulton St., Brooklyn, N. Y.

COMBINATION Self cleaning comb and case. Will dispose outright or royalty. Nothing like it. Carl Duede, Stuart, Iowa.

OUTRIGHT or Royalty. Nutless spindle dustproof for vehicles. Lorenz Felber, 2700 Chartres St., New Orleans, La.

SOMETHING Different. Household necessity. Contains mirror, comb-case, towel-racks, soap-tray, receptacle for wash basin. Made entirely of wire. Cash or royalty. Elmo W. Lee, Freeport, Ills.

FOR Sale—Neck shaving razor guard. Shave your neck in darkest room, any razor. Write W. C. Bridges, 528 Mulberry, Muscatine, Iowa.

THREE Valuable Patents. Animal trap No. 1038246. Hand stamps No. 963340. Hydraulic rams No. 992524. Will sell or trade. Make offer. C. F. Walters, 1718 Monterey St., N. S., Pittsburgh, Pa.

PATENT For Sale or Royalty. Electric shoe shining machine. Operate by coin. Louis Maire, 3806 Delmar Ave., St. Louis, Mo.

FOR Sale! Patent No. 1041428. Internal combustion engine attachment, outright. Also 1273822, automatic wear take-ups for journal boxes. J. M. Christine, R. F. D. No. 1, Box 110, Freeport, Penna.

FOR Sale, cash or royalty, three recent toy patents, broad claims. Swimming man toy, uses hand over head stroke, kicks feet, operated by rubber band. Explosive shell, releases parachute. Magnetic building blocks. For particulors write Dr. O. R. Troje, P. O. Box 653, Ensley, Ala.

AUTOMATIC Carpet and Rug Beater, easily operated by child. Cheaply manufactured. Priced reasonable. Chas. B. Heim, Marco, Indiana.

METALLIC R. R. tie has all the characteristics of the wooden tie. U. S. and Canadian patents. R. T. Burrill, Winchester, N. H.

PATENT Rights, U. S. and Foreign, Spring Metal Hat Clamps for men's hats. New invention. J. C. Wagner, 4102 Wichita Ave., S. W., Cleveland, O.

IMPROVEMENT on Aircraft for Sale. Particulars free. Henry Dennis, 706 N. Jefferson Ave., St. Louis, Mo.

FORD Attachment, U. S. Patent 1,271,-871, extracting Ford Cars from mudholes or sand; a simple one-man device operated by driver from rear of car. For sale outright. Henry Einung, Jasper, Minn.

AUTOMATIC Auto Top. New invention. Am selling county rights. 100% and more profit for any man who gets it. Clean business; unlimited demand. No competition, but act quick. Give reference. Particulars free. G. A. Stenson, L. Box 132, Cokato, Minn.

FLOATLESS Carburetor of merit. U. S. patented. For sale or royalty. Investigate this moneymaker. George W. Storch, 398 North St., Appleton, Wisc.

FOR Sale—Patent No. 1,234,748; Mechanical chauffeur; safe and sane; long drives now pleasure; no cramped arms; fine for beginners, also experts; manufacturing cost small. Lloyd Gaines, Butler, Missouri.

HOUSEHOLD Article, patent granted. "New." Let outright or on Royalty. Details from H. E. Tripp, 1205 E. 12th St., Chattanooga, Tenn.

PATENTS Nos. 1,273,592 and 1,273,755, on Novelty Truss Pad. Cheapest and most effective pad for hernia and ruptures ever devised and will effect cure in ordinary cases. For terms and particulars write J. W. Embree, Box 236, Manhattan, Kansas.

FOR Sale—Patent No. 1,270,787. Garden weeder weeds the plants clean of weeds. Write Henry Coad, Ainsworth, Nebr.

"SCREW Cutting Lathe Attachment." Catches thread every time with very little attention. Suitable for engine or screw-cutting lathe. What do you offer? L. E. Wood, 935 Fruit Ave., Farrell, Pa.

"ADJUSTABLE Rear Sight." Only sight made that is adjustable to shoot to markings. Good market for this. Hans Paulson, Box 477, Orting, Wash.

"SHOEMAKER'S Stand." This stand is readily and conveniently adjusted to any desired position necessary during repairing operation. It has numerous advantages over any other stand and costs a great deal less to manufacture. Shoemakers will immediately see the practical value of this Jack. Meets all requirements desired by any operator. Investigate. Tahavan E Aho, Crosby, Minn.

PATENTS for Sale or Royalty. Household necessity. Made of Aluminum. Particulars free. D. E. Hubbell, Richmond, Ind.

CYLINDER Wrench. Every Thrasher Operator needs one. P. Iverson, Kindred, N. D.

PATENT on Check Rack Register. Necessity for every barber chair. Millions needed. A fortune in this. Small and easily manufactured. D. A. Valvano, General Hospital, Fort McHenry, Md.

SPARK Plug patent for sale; tested double jump. Elmer Raber, Baltic, Ohio.

PATENTED vending machine for souvenir postcards, stamps, advertising matter, with other commodities; live world-wide proposition. Given acid test, proved practical Chicago loop. Owner lacks capital. P. C. V. M. Company, 746 North Harding Ave., Chicago.

FOR Sale Outright or royalty. Patented Automobile Lock. Will operate effectively on all makes and sizes of Automobiles. No exceptions. E. S. McKean, 1 Purser Place, Yonkers, N. Y.

NOTICE—The Ever-Ready Plane Co., of Long Island City desires to organize company to manufacture and market our Combination Woodworking Plane in Canada. We will also consider outright sale. Pres. Wm. Clark, 90 Academy St., L. I. City, N. Y.

A VALUABLE Patent in aluminum sheet metal working. Address H. M. O'Reilly, Indiana, Penna.

RAILWAY Joint Patent for sale or royalty for any style rail. Write John Kossmann, 3884 Wyoming, St. Louis, Mo.

FOR Sale Outright, Patent No. 1,200,946, scale case clip, prevents loss of pocket scales. Fits all pockets and all soft leather cases. For Draftsmen, Toolmakers, Machinists, Foremen, etc. H. E. James, No. 10109 Westchester Ave., Cleveland, Ohio.

FOR Sale—Improved silo patent No. 1,154,511. Investigation invited. Address Jno. O'Connor, Box 277, Mankato, Minn.

PATENT for Sale—Perfected Milk-Bottle Stopper. Write Amanda Oberg, Hager City, Wis.

WANTED—Someone to build Continuous Impulse Reversible gasoline or oil Engines under Patent No. 1,176,724 March 21, 1916. Most economical and inexpensive to build. Would consider the sale of Patent. Address W. T. Smith, Lockland, Cincinnati, Ohio.

VALUABLE Patents for sale or lease on royalty basis. No. 11215 Bean Harvester, No. 10536 Fraction Chart; No. 11121 Trap; No. 10867 Fishing Rod Support; No. 10591 Cigar Holder; No. 11224 Mouth Guard; No. 11304 Spring Wheel; No. 11260 Lath Mill Bolters. For particulars address, Talbert & Talbert, Patent Lawyers, 4687 Talbert Bldg., Washington, D. C.

WANTED—Superior Agents for Superior Made-to-order Raincoats. Entirely different from the ordinary kind. Make $5 to $17 daily. You sell; we deliver and collect. Get facts today. Desk 42, Superior Raincoat Co., Dayton, Ohio.

OWNER will sell outright patent Number 1266627. "Internal Combination Engine Indicator." Jas. D. Renne, c. o. Fairbanks, Morse & Co., Omaha, Nebr.

MANUFACTURER Wanted on royalty basis; new automobile appliance; keeps windshield free from sun and storm. Operates from inside of car; easy to manufacture and put on; adjustable. Write, G. H. Hunt, Monroe Center, Ill.

SIFTER Fire Shovel. Two shovels in one. Cheap to make. Fortune to manufacturer. Best offer gets patent. D. M. Coiner, Statesville, North Carolina.

PAPER-HANGERS. Paper Rest. Patent No. 1,294,577. Leaves both hands free when hanging ceiling papers. Outright or royalty. Nothing like it on the market. Patented Feb. 18, 1919. Edward L. Wallerstedt, Boxholm, Ia.

WILL Sell patent new style folding saw-clamp very reasonably. Simplicity assures high profit. Ernest Potts, 1569 East Everett, Portland, Oregon.

U. S. PATENT on Swinging Gate-Post. Something new. Best offer takes it. Better than anything on the market. Wm. H. Fridley, Anna, O.

"MARBLE Track," interesting new game, good mail order proposition. Russell Teats, 910 Lockbourne Avenue, Columbus, Ohio.

PATENT on Garden Tool. It's great. Cheaply made. John Root, Novi, Mich.

PATENT for Sale—Padlock without key, will sell for reasonable price. Write to Ivan P. Vugrinovic, P. Box 753, Whiting, Ind.

PARACHUTE Attachment for all Airplanes. Patent No. 1,267,847. Fully protects aviators in case of accident to airplane. Full particulars, terms, etc. from A. C. Cambridge, 92 Smith St., Charleston, S. C.

"DOG Foot Brace." Practical, inexpensive. Good investment. Emma Craven, 948 Clinton St., Portland, Oregon.

FOR Sale—Patent No. 1,268,018. Carbon Brush-Holder for Ford Cars; outright or royalty. J. H. Knight, 1502 Lagunda, Ft. Worth, Tex.

PATENTS—My fee payable in monthly installments. Send sketch for advice. Booklet free. Frank Fuller, Washington, D. C.

FUMIGATOR. Patent No. 1,191,266 for sale. Ziegler Hdwe. Co., Clarion, Iowa.

CIGAR and Cigarette Holder. Simple in construction. Reliable and efficient article. Wm. B. McCully, 130 South 9th St., Newark, N. J.

GREASE Cup, especially for automobiles; practical, inexpensive. Merit Machine Mfg. Corp'n, 465 Greenwich St., N. Y.

FOR Sale—Outright or royalty. Billiard Hall Device; nothing like it. Write Jack Crane, Rhodes, Iowa.

OUTRIGHT or royalty—Patent pending. Sanitary Tooth-brush Holder. Nothing like it on the market. Best offer accepted. L. J. Doutlick, 2112 S. 58th Ave., Cicero, Ill.

FOR Sale—U. S. and Canadian patent for a Self-oiling Automobile Spring, no attachment, but part of the leaves. Nothing like it. Write Mathias Kies, 150 Forest St., Dubuque, Iowa.

MUSIC Turner—For piano and organ. Wesley Stackpole, Monroe, Washington.

MAKE Die castings. Sketch, sample, booklet and proposition, 12c. Byrd & Blair, Box 227-C, Erie, Pa.

WILL sell "Patented Attachment"—forms "Headlights" on Automobiles automatically—light follows path car is moving. D. Fornirasco (Owner), Klamath Falls, Ore.

CASH or Royalty. Patent on manure spreader. Write Lou Schneider, Charles City, Iowa.

PATENT for Sale—Padlock without Key; will sell for reasonable price. Write to Ivan P. Vugrinovic, P. Box 753, Whiting, Ind.

TWO valuable and practical patents, "Safe Alarm," No. 1,238,618; "Permutation Lock," No. 1,238,617. Will consider reasonable offer. Steve Zunac, Water St., Coaldale, Pa.

CANADIAN Patent for Sale. Practical combination of hen and hover for purpose of brooding chicks. Best and most successful brooding device ever invented. Succeeds everywhere. No applied heat; no expense to operate. Poultrymen go wild over it. Opportunity of life time to manufacturers. Fred F. Hughes, Hillsboro, Oregon.

HAVE you a Patent to sell? You'll be interested in my proposition. Write now for free particulars. Don't call. F. W. Johnson, 6 N. Michigan Ave., Chicago.

FOR Sale! New style trap nest. Can be placed anywhere. Good for hatching. Laying record attached. Chas. Glander, 60 Sherman Ave., Jersey City, N. J.

I SELL Patents: To buy or sell write me. Established in 1900. Charles A. Scott, 7PM Garson Avenue, Rochester, New York.

MODELS AND MODEL SUPPLIES

BOYS, lots of fun building your own machine shop. Our blue-prints will help you learn drafting while you build the machines. Drafting and Model building. Mechanics Enterprise Co., Brigham Building, Galesburg, Mich. Circular free.

JUST Published—New, up-to-the-minute book on model making that will fill long felt want. Covers workshop practice, design and construction of models. 400 pages, 303 illustrations. Cloth. Price, $3.00 postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago, Ill.

PRODUCERS of Results: Inventions developed. Models, Experimental Work, anything special in metal to order; novelties, spinning castings in any material, electrical devices, patterns of all kinds, plating, general manufacturing, designing, special tools, punches and dies, stampings. Send drawing or sample. Expert information free. John's Engineering Company, Dept. A, Cleveland, Ohio.

INVENTORS—Write for our free illustrated guide book, "How To Obtain a Patent." Highest references. Prompt attention. Reasonable Terms. Victor J. Evans & Co., 165 Ninth, Washington, D. C.

WE make working models for inventors; also dies and stamping of specialties, and carry a complete stock of brass gears and model supplies. Send for catalogue. The Pierce Model Works, 3405 Pierce Ave., Chicago, Ill.

MANUFACTURING

MANUFACTURING Wanted, metal accessories or parts. Patterns, drawings and models made. Write Lee Mapes, 16 Fulton Ave., Rochester, N. Y.

MANUFACTURING model, die and jig making. Alford Machine Co., Goshen, Ind.

INVENTORS and Manufacturers. Experimental work, models, tools, instruments, light machinery. Over twenty years' specialized experience working from samples, blue prints, rough sketches, explanations. Manufacturers' and Inventors' Electric Co., 21 Gold St., New York.

GENERAL Manufacturing, Punch Press Work, Tools, dies, model and experimental work. Moeller Machine Co., 501 Plymouth Court, Chicago, Ill.

DIE Casting and Molds. Hand casting and molds. Everything in white metal is our line. We can help and save you money. Write us. Schley Metal Crafts, 557-59 W. Quincy St., Chicago, Ill.

MACHINE Work quantity production of small parts and complete machines. E. R. Knott Machine Co., 34 Dorchester Ave., South Boston, Massachusetts.

WE are ready now to manufacture your patents. Write us. C. C. Eisener Mfg. Co., Harvey, Ill.

TOOLS, Dies, Manufacturing, Stampings, Models, Experimental work, etc. Mechanics' Engineering & Manufacturing Co., 1392 St. Paul St., Rochester, N. Y., U. S. A.

FOUNDRY, machine shop and boiler shop work. Murray Iron Works Co., Burlington, Iowa.

WE design and build special machinery—metal specialties, etc. A large responsible concern. Industrial Products Co., 338 N. Irving Ave., Chicago.

MAKE Die castings. Sketch, sample, booklet and proposition, 12c. Byrd & Blair, Box 227-B, Erie, Pa.

NOVELTIES, inventions, ideas perfected, experimental work, tools, jigs, dies, production. Send drawing; prices reasonable. Kenerson Stamping Tool Co., Cliftondale, Mass.

PATTERN Makers! A book devoted to the principles of pattern and core making and molding. Written by G. H. Willard, a practical pattern maker of years' experience. This book treats the subject in a much more simple, direct and effective manner than most books along this line. 224 pages, 312 illustrations. Price, $1, postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

HAVE you an idea to develop, a machine to perfect, a product to be manufactured? Do you need special machinery to reduce the cost of your product or a first-class model built, tools, dies or any kind of machine work? If so, write us at once. Our Engineering and Machine Departments are the best. Central Machine Works, 1911 North 12th St., St. Louis, Missouri.

A LARGE Engineering Company with well equipped machine shop, will develop, buy outright, or manufacture on contract, salable articles. We have plenty of capital to handle any article of merit. Industrial Products Co., 334 N. Irving Ave., Chicago.

WIRE Goods, all kinds, made to order. Cooley Mfg. Co., 553 W. Monroe St., Chicago.

MACHINERY, TOOLS AND SUPPLIES

CONCRETE Building Block Machines and molds. Catalogue sent free. 204 South Second St., St. Louis, Mo.

TINNER'S Machines for sale. Bargain. L. F. Culver, Gautier, Miss.

HAND-POWER adjustable speed Post Drill. One-ton chain hoist. Practically new. Charles G. Pape, Fort Wayne, Ind.

MECHANICS—Learn to understand blue print drawings. Complete 169 page book; 228 illustrations; cloth bound; mailed for $2.00. If not satisfied, your money refunded. Educational Institute, 204 Rowland Bldg., Detroit, Michigan.

NEW Lathe, 13 in. by 4 ft. South Bend, full equipment. Price $256.00. First order with cash takes it. McCoy-Brandt Machinery Company, 216 Penn Avenue, Pittsburgh, Pa.

ONE-EIGHTH horsepower Direct Current Motor with blower combined $18.00, sensitive drill, screw cutting lathe, arbor press, forge, hack saw, grinder. Weinthal, Chateau St., Pittsburgh, Pa.

16-INCH Engine Lathe $165. One power hack saw $20. Drill press, grinder, shaper. Standard Machine Tool Co., 164 West Naghten, Columbus, Ohio.

T. C. H. & E. No. 1-A Portable Saw Rigs for Rip and Cross Cut Sawing with 5 h.-p. Gasoline Engine, price $250 each. Charles Weitz' Sons, Contractors, Des Moines, Iowa.

MAKE Your Own Lathe castings and materials for 6 in. x 12 in. back-geared screw-cutting bench lathe. Dwight S. Simpson, Saranac Lake, New York.

ENGINE Lathe, swings 9½ in., takes 25 in. between centers. Complete set gears cutting all size threads 3 in. to 40 in., $75.00. Grammes & Sons, Allentown, Pa.

TIRE Vulcanizer for shop use. Save 25%. Equipment Co., 308 8th St., Cincinnati, O.

ENGINES, MOTORS AND DYNAMOS

2 H.P. DETROIT boat engine, complete, like new, $40.00. Gray 4 h.p. boat engine complete, less propeller, $45.00, perfect. 8039 Parnell, Chicago.

SMALL Motors Bought, Sold, Exchanged. Gerard, 111 Summer Street, Boston, Mass.

MAKE big money installing farm lighting plants. Battery charging outfits, supplies. Get our special demonstrating offer and agency plans at once. Acme Engineering Company, Louisville, Ky.

BLUE-PRINTS: ½ h.-p. Gas Engine, 30c; ¼ h.-p. Steam Engine 50c; ½ h.-p. Boiler and Engine 70c; all 3 for $1.00. Circulars on Castings and Engines for stamp. Modern Model Engineering Co., Monadnock Block, Chicago.

WANTED—Small Gasoline and Steam Engines—Small Lathes, Drill Presses and other light machinery. Will pay high cash prices for good material. Johnston, West End, Pittsburgh, Penna.

SMALL Motors and Generators from Bankruptcy and Receivers' sales. Motors for all phases of current. Immediate delivery. Less than ½ regular prices. See display Ad on page 136. Johnston, West End, Pittsburgh, Penna.

NEW Steam Engines. Practical for all small use. $10.00. James Chambless, Jasper, Ala.

ELECTRIC Motors, A. C., I buy in any condition. W. Lefkowitz, 311 Francis Ave., Schenectady, N. Y.

EXCEPTIONAL values, alternating and direct current motors. Reliable makes only. Tell us your needs. Illustrated catalog, supplies and motors. Hyre Electric Co., 633 BA South Dearborn St., Chicago.

FLOUR & FEED MILLING MACHINERY

SPECIAL bargains in second hand Attrition mills, burr mills, crushers, corn shellers, bran dusters, dust collectors, purifiers, reels, double, single, 2 and 3-pair high roller mills, sieve bolters, receiving separators, scourers, etc. Write for description and prices. Sprout, Waldron & Co., P. O. Box 429, Muncy, Pa.

BLACKSMITHS

BLACKSMITHS. Listen—Learn machine blacksmithing and get big wages with Toy's modern methods doing hard jobs easy. Forging and making solid welds, hardening and tempering to a standard, with colored tempering charts. All for one dollar. Samples free. W. M. Toy, Sidney, Ohio.

ELECTRICAL

ILLUSTRATED wholesale bargain catalog describing motors and supplies including rosettes, wire, tape, plugs, sockets, lamps, switches, loom, fuses, cutouts. Send for free copy today. Hyre Electric Co., 633 KT South Dearborn St., Chicago.

100 INDUCTION motor winding diagrams; 1, 2, 3 phase star delta, 2 to 12 poles inclusive. Postpaid $5.00. E. Glass, 2108 South Broad Street, Philadelphia, Pennsylvania.

MAKE big money installing farm lighting plants. Battery charging outfits, supplies. Get our special demonstrating offer and agency plans at once. Acme Engineering Company, Louisville, Ky.

COILS, Electro-magnets, Solenoids, Resistances, Inductances, Condensers and Special electrical equipment, designed and made to your order. John E. Fast, 5840 Erie St., Chicago, Ill.

FOR MECHANICS

PATENTS—Write for our free illustrated guide book, "How To Obtain a Patent." Send model for sketch and description of the invention for our opinion of its patentable nature free. Highest references. Prompt attention. Reasonable terms. Victor J. Evans & Co., 184 Ninth, Washington, D. C.

FOR THE SHOP

HOW to construct small brass furnace and 500 other valuable articles are contained in Shop Notes Volume Five. 228 pages. Price 50 cents, postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

HOME-MADE Band-saw, Turning Lathe, and Emery Grinder and 500 other valuable articles are contained in Shop Notes Volume Four. 228 pages. Price 50 cents postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

SHOP Notes for 1919 tells 552 easy ways to do hard things. 232 pages, 463 illustrations. Price 50 cents postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago, Ill.

FOR SALE—MISCELLANEOUS

ADDRESSOGRAPHS, Multigraphs, Folders, Duplicators, Sealers, Bought, Sold. Office Device Company, 222-B North Wabash, Chicago.

ELECTRIC Light plant. Fairbanks & Morse make. Will run 150 lights or a motion picture machine. W. H. Murphy, Fox Lake, Wis.

FOR Sale! Latest improved oil burner for sale. Patented in U. S. and Canada. Also Canadian patented improved steam boiler tube cleaner. Edgar G. Teed, Engineer and Inventor, Nuevo, Calif.

PATENT Buyers names free on request. Patent News—e, Washington, D. C.

FLAGS of the Allies. Five flags 2x3 feet, mounted; holder, fast colors, $3.00 set. Parker McLaughlin, Flag Maker, 123 Marle Ave., Bellefontaine, Ohio.

FIELD, Marine, or Aviation Glasses with case. Powerful 20 mile adjustment, $12.50. Money back if not satisfactory. Weil's Curiosity Shop, 20 So. Second St., Philadelphia, Penna.

BUFFALO horns, natural, 75c and 50c each, postpaid. Golden Eagle $18.00, Arctic Owls $8.00 up. Horned owls $6.00. Oil paintings of western life. Write, Allen, Taxidermist, Mandan, N. D.

14 LA SALLE Law Text-Books, cheap. Vose, Concord, N. H.

EXCEPTIONAL opportunity to purchase Encyclopedia Britannica, clothbound Handy Volume Edition, and unabridged Century Dictionary. Both like new. Frank Rose, Box 364, San Jose, California.

FOR Sale—Auto-knitter, brand new, first $40.00 takes it. John Althoff, Waubay, South Dakota.

FOR Sale: Clear-O-Scope Patents and Reg. Trade Mark, covering world's best known Windshield Wiper. Well advertised, established with wholesale trade. Many thousands in use. Some finished stock and equipment. The Clear-O-Scope Co., Angola, Ind.

UNIVERSAL Knitting Machines. Many styles, hand or power. For Catalog, address Daniel Buoker, Peabody, Mass.

FRE-USED Printing Presses. Type and Supplies. List for stamp. Popular Bargains, Richland, Pa.

SALE OR EXCHANGE

FOR Sale at a bargain. Stereoscope slot machine and Royal Plating outfit or trade for Air Brush outfit. J. H. Miller, 18 Monroe, Silver Creek, N. Y.

LET'S Swap! What've got? What d'ye want? Free advertising. Three months dime. Swap Bulletin, Detroit.

WANTED—MISCELLANEOUS

PROGRESSIVE Connecticut Manufacturing Company desires to obtain manufacturing rights on High Grade Mechanical Specialties which can be built of small stampings and screw machine parts. Prefer Automobile Accessories or similar articles which can be sold directly to manufacturers. Only High Grade and fully developed propositions considered. Communicate with definite statement of facts. Address M. G., Room 925, 78 E. Madison St., Chicago.

WANTED—Second-hand Cyclecar; send photo, specifications, price in first letter. Culler Electric Service Co., Orangeburg, S. C.

WANTED—Small specialties, good sellers that could be carried in automobile across continent. Kingsbury, 711-13th St., Washington, D. C.

REAL ESTATE AND FARM LANDS

FLORIDA Lands for vegetables, live stock and general farming. Suburban to Tampa; 20 to 640 acres, $15 to $25 per acre. Easy terms. Write for map and details. North Tampa Land Co., 904 Mallers Bldg., Chicago.

ATTENTION: Let's get acquainted. Cash for your property; farm, general store, hotel or factory no matter where located, confidential service. Hayes Business Agency, Cincinnati, Ohio.

SELL your property quickly for cash, no matter where located. Don't pay big commissions. Particulars free. Real Estate Salesmen Co., Desk B, Lincoln, Nebr.

$2,500 DOWN secures 308 acres, 28 cows and other stock, hay, etc., 2 miles R.R. town. 100 acres smooth machine-worked fields, hay land cutting 100 tons, spring-watered wire-fenced 50-cow pasture, estimated 2,000 cords wood, 100,000 ft. timber; 60 apple trees. Good 8-room house, big basement stock barn, horse barns, granary, corn houses, etc. Owner's interests elsewhere demanding quick sale, $9,350 takes all, easy terms. Details this big money-maker page 35 Catalog Bargains 19 States, copy free. Strout Farm Agency, 312 M, Marquette Bldg., Chicago.

FARM lands in Montana cost less than land of equal productivity sell for elsewhere. Send to Chas. D. Greenfield, State Commissioner of Agriculture, Helena, for information.

CALIFORNIA little farms, near Los Angeles, for sale. Terms. Write E. R. Waite, Shawnee, Oklahoma.

FREE Government Lands—Our official 112-page book "Vacant Government Lands" lists and describes every acre in every county in U. S. Tells location, place to apply, how secured Free. 1919 diagrams and tables, new laws, lists, etc. Price 25 cents postpaid. Webb Publishing Co., Dept. 71, St. Paul, Minn.

FLORIDA'S Best Orange Land Free. If you have $720 cash to buy orange trees to plant on 10 acres of choice land, we'll give you the land. For $1,440 cash you can buy the trees for 20 acres and get the land free. Triflers please don't write. We invite red-blooded men and women who have the above capital for embracing a real opportunity of owning their own orange grove to write today, Board of Trade, 93 Opportunity Avenue, Fruitland Park, Florida.

OZARK 40-acre farm; cottage, barn orchard, spring, team, implements, cows, hogs, chickens; will sell on small monthly payments. Edmund Steckel, Turkey Ridge Farm, Richland, Mo.

TWO tracts of Florida land, ten and twenty acres, for sale or exchange. W. S. Hall, Drawer 494, Stockton, Cal.

FOR Sale—20 acres in one piece in the Penellas Peninsula, near Largo. Lots 9 and 10 of N. E. ¼ and 15 and 16 in N. W. ¼ of sec. 17, T. 30, R. 15. Property convenient to railroad and good roads. Address W., care Popular Mechanics Magazine, Chicago.

ROOTS AND HERBS

$5 A DAY Gathering Evergreens, Roots and Herbs. Ginseng, $14 lb.; Belladonna Seed, $64 lb.; or grow it yourself. Book and war prices free. Botanical, 68, New Haven, Conn.

GOLDEN Seal and 60 Other Plants used in making medicine, dyes, perfumes, etc. How to gather, high war prices, and address of Buyers' Book, postpaid, only 20c. Get yours today. Ginseng Co., West Milan, N. H.

DOGS, BIRDS, POULTRY, PETS

I HAVE two litters of high class English bloodhound puppies from expert man trailer; if you want something good write to Hugh McKiness, Fire Station, Mason City, Iowa.

FOUR Extra Fine Reserve Airedale pups, registered. M. Campbell, Humboldt, Kan.

LOTTIE E. DANIELS, Box 706, Gary, Ind., will tell you free how she doubled her egg supply. Write at once.

BELGIAN HARES, GUINEA PIGS, ETC.

THE Metropolitan Pet Stock Yards, Roslindale, Mass., America's Largest Winners, offer pedigreed, registered and utility Belgian Hares, Flemish Giants and New Zealand Reds. We buy all you raise at 30c to 75c a pound. Female Cavies $2 each, boars $1.50. White mice $1.10 a trio. Deicke's Cavy Book and Gibson's Rabbit book, best published on their subjects, $1 a copy. Send for circular and sales list.

BIG Money—Raise Rabbits For Us. Belgian, New Zealand, Flemish Giants. We sell stock and pay $7 pair. Express all rabbits raised from our Pure Bred Stock at our expense. Contract and literature 10c. None free. United Fur and Produce Co., Inc., Dept. 23, 3017 Wilson Ave., Chicago.

RAISE Guinea Pigs for us. We buy all you raise. Pay better than poultry. Contract, particulars, booklet how to raise free. Cavies Distributing Co., 3102-A Grand Ave., Kansas City, Mo.

FLEMISH Giants, Belgian Hares: $1.00 pound for all you raise from our stock; Cavies, White Mice. Stamp please. Arthur Schumacher, Norwood, O.

RABBITS. Big money made in raising rabbits. We furnish you the rabbits and buy back all you raise. Particulars and contracts free. Ruffus Red Rabbit Farm, 2603 So. Penn. Ave., Denver, Colo.

AMERICA'S Largest Winners, the Metropolitan Pet Stock Yards, Hayward A. Johnson, Owner, Roslindale, Mass., offer Belgian Hares, New Zealand Reds, Flemish Giants. Send for circular PS. Commercial Giant does now bred, $15 each. Belgian Hares 3 to 5 months old, fully pedigreed, $12.50 a trio. Utility stock $6 a pair. We will buy all your young and pay 30c to 75c a pound. Female Guinea pigs $2 each; Unrelated boars $1.50. Gibson's Rabbit Book and Deicke's Cavy Book, best published, $1 a copy. Will gladly refund your money if not satisfied.

OUR Rabbit and Guinea Pig Magazine shows you how to raise all kinds of rabbits and Guinea Pigs and where to buy and sell them from $2.00 to $15.00 each. Send 25c today for four issues, or 10c single copy. American Breeder's Company, 132 Nassau Street, Department 26, New York.

RAISE Rabbits. Big demand. Very profitable. Plans 10c. Adams Bros., Portland, Mich.

FLEMISH Giants, pedigreed, registered, heavy type. Flower Farm, Bellefontaine, Ohio.

RAISE Flemish Giant Rabbits and Belgian Hares for us; $7.00 pair and express charges for all raised from our stock. Contract and full instructions for housing, feeding, breeding, shipping, 10c. Hunters' Rabbitry, Jamaica, N. Y.

PET Stock World. America's Oldest Small Animal Magazine. Copy 10c; None Free. 6 month 50c; yearly $1.00. 865 World Building, Baltimore, Md.

PERSONAL

ACCIDENTALLY discovered pleasant Florida root, easily, inexpensively, overcomes any tobacco habit. Gladly send particulars. Franklin Stokes, Mohawk, Florida.

THE Diamond and Gold Mint is liberal and prompt. Send us by mail or express any discarded jewelry, new or broken, diamonds, watches, old gold, silver, platinum magneto points, false teeth or bridge work. We send cash at once and hold your goods until we hear our offer is accepted. If not satisfactory your goods are returned at our expense. Highest bank references. Address The Diamond Mint, Dept. G, 3102 Euclid Ave., Cleveland, O.

DENTIST'S discovery removes all tooth stains. Guaranteed. Trial 25c. Free Booklet. Dr. Lewis Tewksbury, Stonington, Maine.

ST-STU-T-T-TERING and Stammering cured at home. Instructive booklet free. Walter McDonnell, 46 Potomac Bank Building, Washintgon, D. C.

McJAMES DEAN come home; your wife Cora loves and wants you.

WHY sell Perfumes, Toilet Goods and Flavoring Extracts for others? Make your own; write Laboratory, Box M-1316, Memphis, Tenn.

HIGHEST Cash Prices for craftsmen's bench filings and scraps of gold, silver and platinum, painters' gold-leaf cotton, magneto points, mercury, false teeth (with or without gold fillings), discarded jewelry, watches or diamonds—valuables of every sort. Nothing too large, too small, too old or broken—we send actual value in spot cash by return mail and hold your goods awaiting your acceptance of remittance. Dun and Bradstreet references. Ohio Smelting & Refining Co., 205 Lennox Bldg., Cleveland, Ohio.

MAKE any clock self-winding. Simplified instructions for 25c. Page, 127 Sanford, Orange, N. J.

IS Tuberculosis a food disease? The answer: "Tuberculosis vs. Food." 25c. James English, Food Specialist, 1029 32d St., Denver, Colo.

SKIN!!! Would you give 50c to clear your skin of pimples and blackheads. Send 50c in stamps for my successful formula. Address—"Success," 638 West 37th St., Savannah, Ga.

FREE—Stop using tobacco. We will give free information how to conquer habit easily and permanently. Results Guaranteed. Anti-Tobacco League, Box 370, Omaha, Nebr.

Additional Classified Ads Page 44

Make a Bigger Income
Learn Draftsmanship

The plan of Chicago "Tech" is to enable men to step into the technical field prepared to do the kind of work that brings good salaries.

We are practical men here and we teach in a practical way. We deal with the very problems which have to be solved in the shop, in the architect's office, in construction work of all kinds.

We save time for the student because he concentrates on essentials—not on mere theories. We turn men out ready to deliver service.

I shall be glad to answer any letters from men who write to me personally.

C. W. Morey,
President.

Great demand for draftsmen now. Still greater demand in prospect. Take up this paying profession. The Chicago "Tech" method is the quickest, easiest way to become a draftsman in spare time while you hold your present position. That proved before you pay a penny. (See free lesson offer below.) No question about the opportunity. Business is expanding, pushing, doing. Factories humming. Our own needs in equipment, in building, in construction and Europe's needs in reconstruction mean busy times in American industry. Send coupon. Learn how to earn

$25 to $100 a Week or More

Draftsmen are wanted wherever the wheels are turning, wherever work is being planned. Salaries larger than ever paid before—and chances for advancement to executive positions. Let every man with his future to make at least investigate the possibilities. Learn about the Chicago "Tech" method. At least get the test lesson. See how it interests you—how clearly it presents every point. No abstrusetheories. Everything practical—and made simple. A common school education all you need.

Drawing Outfit

(No Extra Charge)

Every student of the Chicago "Tech" Home Study Courses in Draftsmanship receives this drawing outfit—set of instruments in case, drawing board, T square, triangles, scale, curve, drawing paper, pencils, etc., or a cash credit in case he already has an outfit. These instruments are of the same make and sizes as used by high salaried experts in drafting rooms of factories, shops, railroads, etc. You use them while learning—then take them right into your practical work.

Auto and Gas Engine Course

All about automobile mechanism—its construction, operation and REPAIR—taught by mail. You train directly under the Chicago "Tech" automobile experts. Splendid opportunities open now.

Learn All This in Spare Time

All about the Principles of the Automobile.
All about Gasoline Engines.
All about Power Plants and Transmissions.
All about Carburetors and Fuel Supply Systems.
All about Lubrication and Cooling.
All about Batteries.
All about Magneto Ignition.
All about Starting and Lighting Systems.

Know How To Fix Troubles

Most complete instruction in auto repair work. Equips you for high pay or to start a business. Big demand for trained repair men.

Write Send the coupon and get catalog and all information now.

Come to the College or Train At Home

Wherever you are, you can have this Chicago "Tech" training. Complete instruction by mail. Exercises, lessons, personal direction of our experts right in your own home if you cannot come to the college for a resident course. Every lesson, exercise and lecture the work of a specialist—an expert. Not only instructive, but fascinating to the man with an ambition to master this profession. Send the coupon and get the facts.

Easy Payments

The fees for Chicago "Tech" courses are very moderate—and you can pay on easy terms. And also—you can obtain in a few months what it would take several years to acquire by ordinary methods. You can get an early start. You are soon ready to take a paying position and to quickly get back the cost of your course.

FREE TEST LESSON

Other institutions ask you to pay first—and then to find out later how well qualified you are for this profession. We send the free lesson first and place you under no obligation at all. Discover your qualifications before you pay anything. See for yourself just what Chicago "Tech" offers you. The coupon will bring all the facts about the course, the small fee, and the easy terms.

NOW Mark with X the branch you are interested in—or if in doubt about which course to take, write a letter stating facts about yourself and asking our advice which will be freely given. Mail either the coupon or the letter today.

CHICAGO TECHNICAL COLLEGE, 630 Chicago "Tech" Bldg., CHICAGO

Without obligation upon me, send your Catalog on subject indicated below. Also FREE Lesson **if inquiry is on Drafting or Plan Reading.**
Mark X opposite work in which you are especially interested.

[ ] Architectural Drafting	[ ] Sheet Metal Drafting	[ ] Estimating
[ ] Machine Drafting	[ ] Builders' Course	[ ] Surveying
[ ] Electrical Drafting	[ ] Plan-Reading—Buildings	[ ] Map Drafting
[ ] Structural Drafting	[ ] Plan-Reading—Shop Men	[ ] Autos and Gas Engines

Name.....

Address.....

City..... State.....

College or Home Study? State which.....

Please Mention Popular Mechanics

Continued from Page 42

ANTIQUES AND RELICS

WAITLEY'S Antique Shop. Large collection "Alaska" Indian relics. Write for list. Worthington, Ohio.

GENUINE Indian Baskets — Wholesale Catalogue. Gilham, Highland Springs, California.

INDIAN Relics, 44 page catalog free. Grutzmacher, Mukwonago, Wis.

MISCELLANEOUS

GUARANTEED Solid 14 Karat Gold Safety Self Filling Fountain Pen—The "Liberty"—on ten days' trial for $1. Delivery guaranteed. $1.10 back for it—if you want it. Send your address and the $1. (at our risk). Address, Laughlin Mfg. Co., 200 Majestic Bldg., Detroit, Mich.

GOOD Prices paid for butterflies, insects. See Sinclair's Display advertisement on page 16.

LEATHER palm Mackintosh gloves, 35c pair. Joseph Demenkow, Holbrook, Mass.

LET me send you a harmless and agreeable recipe to stop the odor and relieve your sore feet for one dollar. Guaranteed or money refunded. Louis Burchard, 119 East Vermijo St., Colo. Springs, Colo.

NAMES—One dozen cards, by Penman, for quarter. B. 357 Snediker Avenue, Brooklyn, New York.

ICELESS Refrigerators easily, cheaply built. Instructions, blueprints; 4 different types $1.00. Bachman, Box 57, Fullerton, Pa.

5% TO 7% Profit. Japanese Incense, 10c sample. Yama, Box 281, Sta. C. Los Angeles, Cal.

SEND $3.96 and photograph of yourself, mother, wife, children, friend, etc. We will return an elegant 14x20 inch, hand finished, convex, artistic enlargement. Satisfaction guaranteed or money refunded. Studio, 461 West 18th, New York.

LOCKSMITHS. How to unlock cylinder and all locks. 100 tricks of the trade $1.00; money back if dissatisfied. Routson, 3406 Andover St., Oakland, Cal.

RATS and Mice exterminated forever, only 25c. Hinton, Turner Street, Utica, N. Y.

STORE Bundle-Carrier, Welshbach Lamp; Cheap. Herman Daumler, Columbus, Ohio.

COLORED Luminous Paint for watches, etc. Shines yellow. Bottle, 25c. Commercial Laboratory, Barron, Wis.

FOOL the Burglars. Get one of my imitation locks. Easily installed. Send 35c for sample. Louis Ullman, 47 Murray Street, New York City.

"COLT Automatic Pistols," caliber 25; safest and most efficient pistols made. 7 shots; 4½ in. long; order now. Postpaid $19.00. H. Wagner Company, Monongahela, Pa.

MAKE Die castings. Sketch, sample, booklet and proposition, 12c. Byrd & Blair, Box 227-D, Erie, Pa.

OXY-ACETYLENE Welding and Cutting, Electric and Thermit Welding. Brand new book of practical instruction in this process. The workman will find all necessary information for handling any kind of welding. 215 pages, fuly illus. Cloth, $1.00; Leather, $1.50 postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

TAKE Your Bath at Our Expense. To introduce our famous Royal Bath Balm in every locality, will send trial package absolutely free to anyone who has never used it. You don't know the real luxury of a bath till you've tried this wonderful preparation. Makes you feel good all over. Cleanses the pores. Softens the skin. Soothing, healing, antiseptic, purifying. Write for Free Sample; also Free Booklet. Royal Bath Balm Co., Box A. E., Little Falls, N. Y.

REGULATIONS for the Army of the U. S.—With our army at a permanent strength of 500,000, our increased military activities abroad and our constant need of a state of preparedness, many will wish to know and study our army regulations. This is the standard book. 400 Pages. Cloth. Price $1.00 postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago, Illinois.

I WANT to send you proof of the wonderful pulling power of Popular Mechanics classified pages. What's your proposition? Write me today. F. W. Johnson, Manager Classified Advertising, Popular Mechanics Magazine, 6 N. Michigan Ave., Chicago.

BE Smart. Fashionable European Hotel Labels for your baggage, specimens post free, ten 2c stamps each. Agents wanted, big profits. Continental Agency, City Buildings, Nottingham, England.

MENSURATION for Sheet Metal Workers. This 128-page book gives practical problems for the tinsmith, cornice and skylight maker, slate and metal roofer. 115 illus. Cloth. Price $1 postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

GRANDFATHER'S Clock Works $5.00. Build your own cases from our free instructions. Everybody wants a hall clock. You can make good profit building artistic clocks for your friends. We replace worn-out works in old clocks with works having chimes at money-saving prices. Write for folder describing the most beautiful hall clock ever sold at $25.00. Clock Co., 1673 Ruffner St., Philadelphia, Pa.

CUTS anybody can make. Simple, cheap process, $1. Specimens, particulars, 2c stamp. M. Day, Windfall, Ind.

SIMPLE Soldering, both hard and soft—83-page book, telling how to join metals. Do your own repairing. 53 illustrations. 25c postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

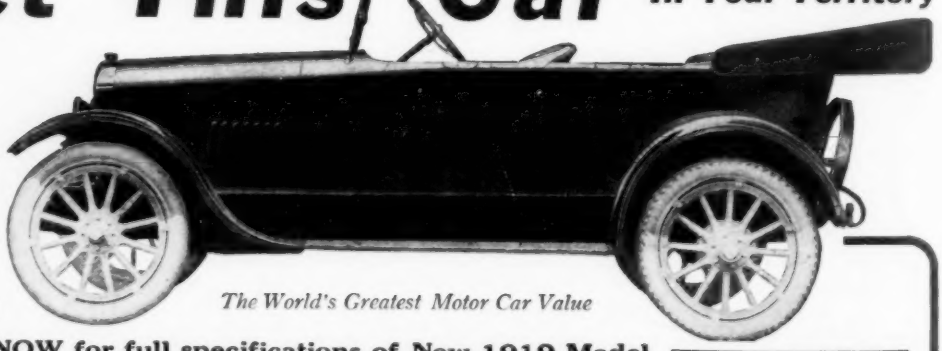
Get This Car And the Agency In Your Territory

115-inch Wheelbase

32x3½ Tires

36 H. P.

Electric Lights and Starter



The World's Greatest Motor Car Value

Write NOW for full specifications of New 1919 Model

BIRCH SUPER-FOUR

FIND out how you can get one of these superb cars for yourself and make money selling them to others. A big opportunity is open to ambitious men who are willing to train themselves and then get out and hustle. We pay big commissions for selling Birch Cars.

Birch Agents Prosper

One of our Texas Agents sold two carloads of Birch Cars within 60 days after he received his first demonstrating car. Whether you own a car or not get full details of our great offer.

SEND THE COUPON NOW FOR FULL INFORMATION.

BIRCH MOTOR CARS
Dept. 619, 81 E. Madison St., Chicago

Please send free book and full particulars as to Birch Super-Four and Agency.

Name.....

Address.....

Previous Experience Not Necessary **We require all our agents to take a brief but thorough course of training in Automobile Driving, Repairing and Selling. We have trained hundreds of others for success in this way, and we believe this is one of the reasons for the splendid success Birch Agents are enjoying.** But the BIG REASON is the cars themselves. 80 per cent of all Birch Cars are in use by farmers and in small towns, and get the hardest kind of service. Mud, sand, rocks, hills and rough going have no terrors for these sturdy cars.

Send Coupon for BIG FREE BOOK and Full Information

You will be astonished at the liberality of our offer. Let us put all the facts before you at once. It costs nothing to investigate, so tear off the coupon right now. **Sign it and mail it to us today.**

BIRCH MOTOR CARS **Dept. 619, 81 E. Madison St. CHICAGO, ILLINOIS**

Member of Chicago Association of Commerce

Don't be a Slave to a Machine

The machine shop spells opportunity and big pay. It is the starting place of great inventors and designers. Machinery, appliances and all sorts of things needed in our daily life. The big world of industry revolves around the machine shop. *You* can win success through the machine shop. You can reach a high position at big pay — *if you avoid one danger* — if you take care not to become a slave to one machine all your life.

27 ENGINEERS TEACH YOU
MODERN SHOP PRACTICE

Here is the way by which you can know all there is to know about machinery. Here is a way by which you can put yourself in line for quick promotion, or to be your own boss. 27 Mechanical Engineers, Designers and Specialists in shop methods and management have combined to produce a spare time reading course that will make you familiar with all details of Modern Shop Practice. Whether you are apprentice, mechanic or shop foreman, or whether you are a man on the outside with a desire to know machine shop methods and practice, this great reference library brings you the information you need.

Six Volumes Shipped Free

You are not asked to buy them now. You are simply asked to write for a 7 days' free trial of this six volume set of "Modern Shop Practice." Just pay the small shipping charges when the books arrive. Send the coupon and the 6 books will be shipped to you at once for 7 days' free examination. Ask any mechanical expert what he thinks of them. If you and your friends do not consider them worth several times their price, send them back to us, and you won't owe us a cent. If you keep them, simply send us $2 within 7 days and then $2 a month until you have paid us this special introductory price of $19.80.

What the Books Teach

It sets forth simply and clearly everything you want to know — all details of shop management, production, metallurgy, manufacturing, welding, die-stamping, tool design, tool making, foundry work, molding, casting, forging, pattern making, mechanical drawing, machine drawing and design, and automobile shop work.

Consult Experts Without Cost

If you order "Modern Shop Practice" at once we will enter your name for a regular $12 Consulting membership in the American Technical Society for the period of a year. This entitles you to the advice and counsel of our staff of engineers on any problem you may have within the scope of the books.

Only 7c a Day

Six splendid volumes bound in flexible American Morocco, gold stamped, 2300 pages, 2500 illustrations, photographs, drawings, diagrams, tables — everything to make it easy for you to learn; all this comes to you in this magnificent six-volume set of MODERN SHOP PRACTICE, which has gone through six editions and which has helped to promote thousands of mechanics into well-paying positions as engineers, shop superintendents, shop owners, etc.

PARTIAL LIST OF CONTENTS

Shop Work — Shop Kinks — Gear Cutting — Turret — Lathes — Screw Machines — Manufacturing — Shop Management — Metallurgy — Welding — Die Making — Metal Stamping — Tool Making — Punch and Die Work — Tool Design — Foundry Work — Malleable Practice — Forging — Pattern Making — Molding Practice — Mechanical Drawing — Machine Drawing and Design — Automobile Shop Work.

Send No Money

Right now tear off, fill in and mail the coupon. No money in advance. No obligation. You owe it to yourself to inspect these books in your home and see if they will not prove salary-boosting volumes for you. Send coupon at once.

AMERICAN TECHNICAL SOCIETY
Dept. M-119A
CHICAGO
ILL.

AMERICAN
TECHNICAL SOCIETY
Dept. M-119A
CHICAGO, U.S.A.

Please send me, shipping charge collect, set of Modern Shop Practice for seven days' free examination. If I decide to buy, I will send $2.00 within seven days and the balance at $2.00 a month until $19.80 has been paid. Then you send me a receipt showing that the $30.00 set of books and $12.00 consulting membership are mine, and fully paid for. If I think that I can get along without the books after the seven days' trial, I will return them at your expense.

Name.....

Address.....

Reference.....

HOW To Speak In Public

Just mail coupon and I will send you postpaid my wonderful book, "How To Speak In Public"—the most fascinating and helpful book you ever read. Lays bare the secrets of oratory—gives methods of famous orators—tells you how to prepare speeches on any subject—how to address lodges and club gatherings, directors' meetings, etc. Introduction by Elbert Hubbard. Appendix by Dr. Orison Swett Marden. Covers entire field of public speaking. Some topics covered are: "How to Overcome Bashfulness;" "Methods of Great Orators;" "Securing Confidence of Audiences;" "How to Make Speeches That Win;" "Wit;" "Humor;" "Pathos;" "Climaxes." Contains a wealth of Original Ready-Made Speeches, Toasts, Anecdotes, etc., suitable for any occasion.

No Money In Advance

Send the coupon. The book will come to you at once, postpaid. Keep it for 5 days. Let the book itself convince you that it will give you a wonderful, magnetic command of English—teach you how to think "on your feet." If you think that you can afford to be without it—if you don't say it is the most wonderful—the most interesting, helpful and inspiring book you ever read—send it back. Otherwise, pay only $2 and this great book—brimful of the information that you have long been waiting for—is yours. You will never be at a loss of what to do or say. In a crisp, right-to-the-point manner it gives you a complete knowledge of how to speak in public without burdensome readings. DeLuxe edition bound in heavy red canvas, gold and black embossed. 300 pages. It is a book you simply must have. Send coupon today and see for yourself. Send no money.

Henry Dickson School of Oratory,
47 Hearst Bldg.
Chicago, Ill.

Henry Dickson School of Oratory, 47 Hearst Bldg., Chicago, Ill.

Name.....

Address.....

Send me, at once, postpaid, your book, "How to Speak in Public." At the end of 5 days, I will send you $2 or return the book to you.

ELECTRICAL ENGINEERING

B. S. Degree in 3 Years

Electrotechnician Diploma in 18 Months

School of Engineering of Milwaukee specializes in Electrical Engineering. College Degree B. S. in 36 months. **Special, condensed intensive training in electrotechnical work for early graduation to fill demand for electrical experts for coming period of reconstruction.** Full provision for making up all deficient high school and preparatory school credits. Also 1-year practical electrical courses and 6-months Electrical Trade and Drafting courses. "Earn While You Learn" if you like. 1 week school and 1 week work in practical electrical department. Intensive training for Electrotechnicians and Electrical Engineering students for first 6 months; thereafter half day school and half day paid employment, or half day athletics under competent athletic director. Board and lodging at cost at Students' Fraternity House. **New term opens July 1.** Write for catalog and full particulars. Mention age and education.

SCHOOL OF ENGINEERING OF MILWAUKEE
92—373 Broadway **Milwaukee, Wis.**

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, of Popular Mechanics Magazine, published monthly at Chicago, Ill., for April 1st, 1919.

State of Illinois, County of Cook, ss.

Before me, a notary public in and for the state and county aforesaid, personally appeared H. H. Windsor, who having been duly sworn according to law, deposes, and says that he is the editor and business manager of the Popular Mechanics Magazine and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit: 1. That the names and addresses of the publisher, editor, managing editor, and business manager are: Publisher, Popular Mechanics Co., 6 No. Michigan Ave., Chicago, Ill. Editor, H. H. Windsor, 6 No. Michigan Ave., Chicago, Ill. Managing Editor, J. L. Peabody, 6 No. Michigan Ave., Chicago, Ill. Business Manager, H. H. Windsor, 6 No. Michigan Ave., Chicago, Ill. 2. That the owners are (Give names and addresses of individual owners, or, if a corporation give its name and the names and addresses of stockholders owning or holding 1 per cent or more of the total amount of stock): H. H. Windsor, 6 No. Michigan Ave., Chicago, Ill. 3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages or other securities are (If there are none, so state): None. 4. That the two paragraphs next above, giving the names of the owners, stockholders and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

H. H. WINDSOR.

Sworn to and subscribed before me this 22d day of March, 1919.

J. GRAHAM,
Notary Public.

(My commission expires June 17, 1920.)

FINLAY Engineering College

KANSAS CITY, MISSOURI

ONLY SCHOOL OF THE KIND IN THE WEST

Specialties; Electricity, Steam, Gas, Armature Winding, A. C., D. C., Auto.

Intensive training courses, six weeks, three and five months, night and day. Enroll any time. *Write for Catalog W.*

LEARN TO WRITE ADVERTISEMENTS

Our Government urges firms to Advertise Now. This means more Positions paying up to $100.00 a Week. We teach you by Mail this most Profitable and Fascinating Profession in few months' time. WRITE TO-DAY FOR FREE FACTS.

PAGE-DAVIS CO., CHICAGO

TRAFFIC MEN WANTED

Big shippers want trained traffic managers who know how to conform with government regulations and secure lowest legal freight charges. Salary ranges from $2,100 to $10,000 per year. Ask us for details of how you can become a Traffic Manager by easy home training. Write today—now.

AMERICAN COMMERCE ASSOCIATION, Dept. 106, American Commerce Bldg., Chicago, Illinois

WANTED

Men—Boys, 18 to 35, to become

Railway Mail Clerks

Commence $1100 a year

Rapid advancement to higher Government Positions. "No lay-offs" because of STRIKES, WARS, DULL TIMES, FINANCIAL FLURRIES or the WHIMS OF SOME PETTY BOSS. THE POSITION IS YOURS FOR LIFE.

Country residents and city residents stand the same chance for immediate appointment. Common-sense education sufficient. Political influence NOT REQUIRED.

Write immediately for free list of Goverment positions now obtainable. Don't delay. Every day you lose means the loss of just so much chance of your early appointment.

FRANKLIN INSTITUTE, DEPT. F100, Rochester, N.Y.

FRANKLIN INSTITUTE, Dept. F100, ROCHESTER, N. Y.

This coupon, filled out as directed, entitles the sender to free specimen questions; a free copy of our book, "Government Positions and How to Get Them," a list of Government positions now open, and to consideration for Free Coaching for the position here checked.

COUPON

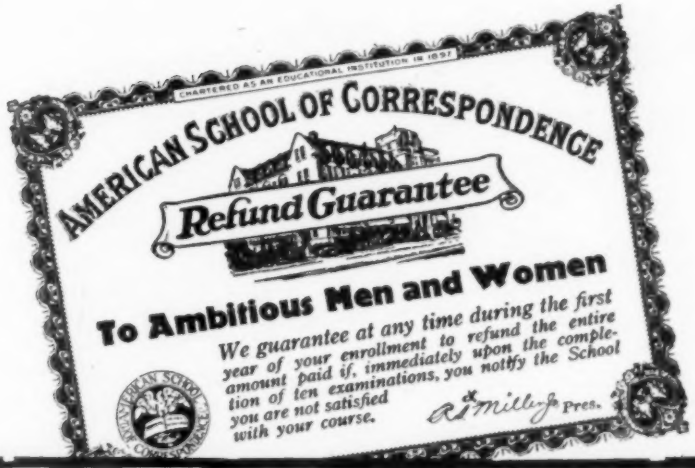
..Railway Mail Clerk..	($1100-$2000)	..Customs Positions....	($ 900-$1500)
..Postoffice Clerk.....	($1000-$1500)	..Internal Revenue....	($ 900-$1800)
..Postoffice Carrier....	($1000-$1500)	..Stenographer	($1100-$1500)
..Rural Mail Carrier..	($ 720-$2160)	..Clerk in the Departments at Washington	($1100-$1500)
..Bookkeeper	($1100-$1800)		

Name .....

Address..... F100

Use this before you lose it. Write plainly.

Please Mention Popular Mechanics



Find Out What Training Means to You

What It Has Done Intensive training has qualified men like YOU for the positions they wanted — given them steady employment—made them sought after by employers—multiplied their earning power — made them leaders in their chosen lines. For thousands, it has changed the drudgery of "getting by" into the joy of GETTING ON. Do you realize that the *same* intensive training can do the same for you?

Why It Does It Doing things better than the other fellow—thinking and acting for yourself—having a grip on your task — the expert touch — the trick of KNOWING HOW—that is why you succeed after intensive training. *That is what it does for you.* Training clears away the cobwebs, throws the spotlight on the things you don't know about your work, and makes you the master of any emergency.

Don't Fool Yourself

Every day you put off training you have to pay the price of *not knowing how.* The amount you earn represents what you know—what you can DO. The problem of how to increase your earning power is simple—just TRAIN. Don't be fooled into thinking that "luck" or "pull" will make you a winner. The man without training just scrambles through life —never a money-maker—never sure of his job—never holding a responsible position. It's the trained man who gets all the favors—the best jobs and the big pay. As long as you refuse to train you must pass up opportunities and make way for the man who does. Face the facts and then let the American School help you into a better position—the one you want—as it has helped its thousands of students. Get into the game. Don't sit on the sidelines.

You Take No Risk

We guarantee our service to you—absolute satisfaction or your money back—so why delay promotion and better pay? Every day you put off training it costs you money—money that you might be getting but DON'T because you *don't know how.*

The American School's guarantee above means that you can test what training will do for you without risking one cent of your money. We've got to make good with you, so check and mail the Coupon—NOW—for Free Bulletin.

AMERICAN SCHOOL OF CORRESPONDENCE
Dept. A. G. 74 CHICAGO, ILLINOIS

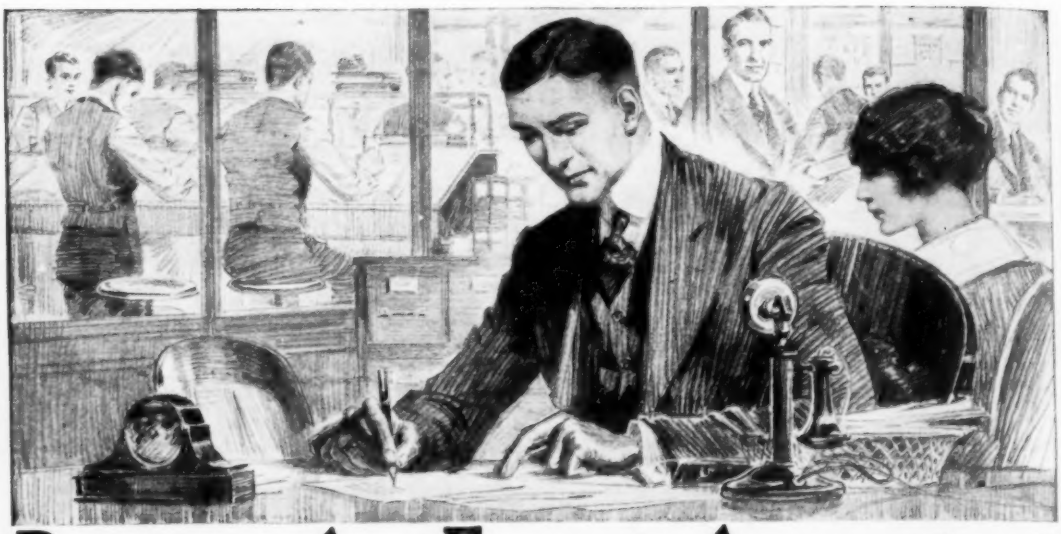
TRAINING—THE KEY TO SUCCESS

Please send me booklet and tell me how I can fit myself for position marked X

...Western Union Course
...Telephone Engineer
...Draftsman and Designer
...Automobile Engineer
...Automobile Repairman
...Airplane Mechanic
...High School Course
...Fire Insurance Adjuster
...Sanitary Engineer
...Heating and Ventilating Engineer
...Master Plumber
...Civil Engineer
...Structural Engineer
...Mechanical Engineer
...Shop Superintendent
...Accountant and Auditor
...Steam Engineer
...Lawyer
...Business Manager
...Certified Pub. Accountant
...Bookkeeper
...Stenographer
...General Education Course
...Com. School Branches
...Electrical Engineer
...Electric Light and Power Superintendent
...Hydroelectric Engineer
...Wireless Operator
...Architect
...Building Contractor

Name .....

Address .....



Become An Expert Accountant

The difference between the men on the high stools and the man in the private office is simply **training.** The men outside stopped when they arrived at the bookkeeping stage. While they reached their limit here, he became a Higher Accountant. Now he has "arrived" as an executive.

Spare time training gave this man a mastery of business analysis and organization. He charts the condition of the business and shows officers and directors in figures where they can save, where they can apply more efficient methods and where every department stands all the time.

Thousands of men like him are wanted by our great corporations. Financiers and business men pay big fees and salaries to have conditions accurately shown. Incomes of Higher Accountants range from $3,000 to $10,000 a year or more. And now the government demands accurate income reports. The Expert Accountant's service here may save embarrassment and heavy expense.

Train By Mail

You can master Higher Accounting in your leisure time, while you hold your present position. The LaSalle method will train you by mail under the direct supervision of William B. Castenholz, A. M., C. P. A., Former Comptroller and Instructor, University of Illinois, assisted by a staff of Certified Public Accountants including members of the American Institute of Accountants. These experts will instruct you in the very methods they use in their own work.

Under the thorough coaching of these experts, you will be thoroughly drilled in the underlying principles of modern Business Analysis and Organization, Accounting, Auditing, Cost Accounting, Commercial Law and Financial Management. LaSalle accountancy training will qualify you to pass the C. P. A. examinations, to hold an executive position, or to enter business as an Expert Consulting Accountant. Membership also includes free use of our Consulting Service which brings advice whenever needed on special business problems. No large fees; no large amount to pay down. This instruction is offered on a convenient monthly payment plan.

Send the Coupon

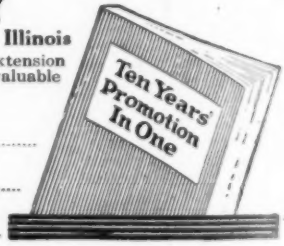
Already over 145,000 business men have profited from LaSalle training. More than 20,000 enroll annually in our various courses. You, too, can get the benefits offered by our organization of 800 people including 300 business experts, instructors, text writers and assistants.

Send today for information about this course which has helped so many men to rise. The coupon will also bring our valuable book, "Ten Years' Promotion In One". Write for your copy now. It's free.

LASALLE EXTENSION UNIVERSITY

Dept. 664-HA *"The World's Greatest Extension University"* **Chicago, Illinois**

Without cost or obligation on my part, please send me particulars regarding your Extension Course of Training in Higher Accounting and your Consulting Service. Also a copy of your valuable book for ambitious men, "Ten Years' Promotion In One."

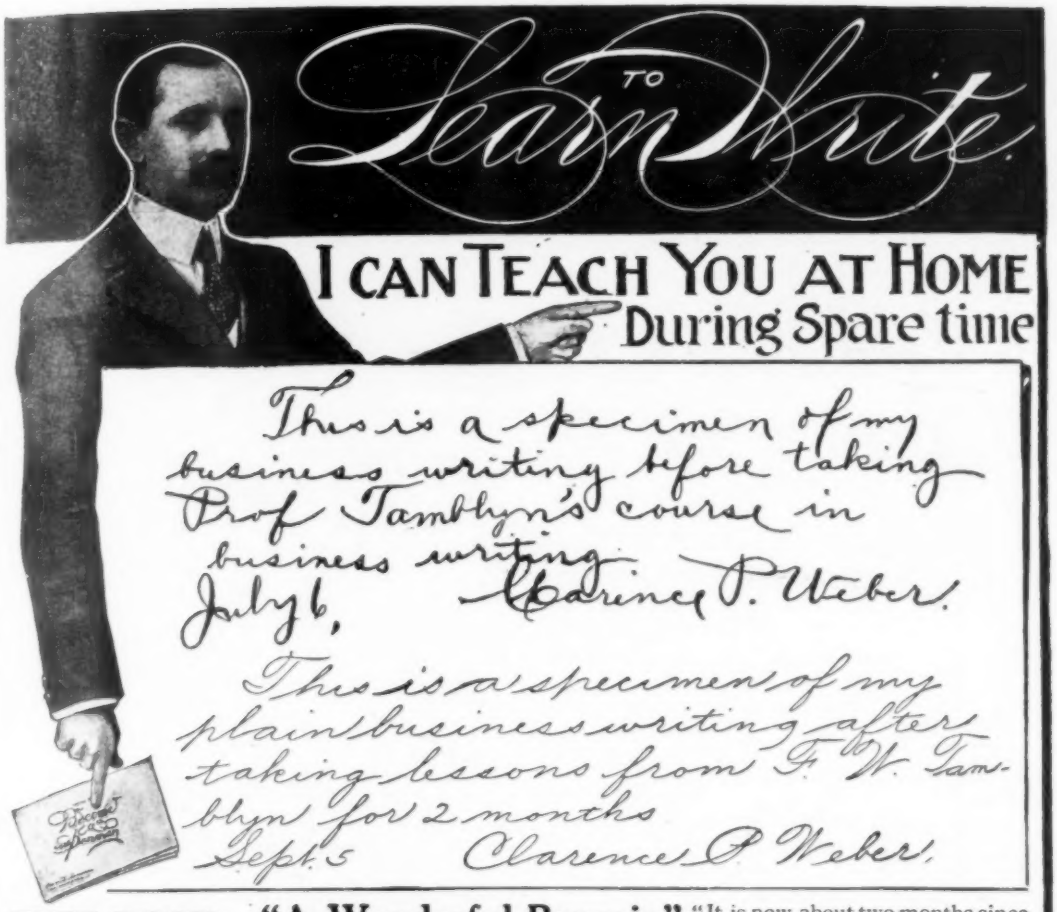


Name .....

Present Position .....

Address .....

Please Mention Popular Mechanics



FREE BOOK

My 32-Page book **"How to Become a Good Penman"** is FREE to anyone who wants to write better. Contains copies and information that will help you, and beautiful specimens that will make your eyes twinkle with delight.

WRITE FOR IT—use the coupon below—or a postal will do—but

Send at Once!

If you enclose a stamp, I will write your name on a card with white ink, making one of the prettiest specimens of penmanship you ever saw

"A Wonderful Bargain"

"It is now about two months since I began your course, and while I am not quite half through with Business Writing, I am delighted with my improvement, which is quite marked as you will see by comparing my present writing with the specimen written when I began. My parents objected to my taking it up, but now see I'm getting a wonderful bargain."

—CLARENCE P. WEBER, Middletown, Del.

Good Writing Is the Very Foundation of Business Success

I can make a good penman of you at your own home, in your spare time, no matter where you live or how poorly you now write. Ever fail to secure a good position because of poor penmanship? Ever know of better positions you could have stepped into if you only wrote a good hand? If not, you're an exception. The advantage of good penmanship is seen all around us.

Mr. Weber's wonderful improvement shown in the specimens above was made in 2 months. Hundreds and hundreds of others in all parts of the country are doing the same.

YOU CAN DO AS WELL

I have been teaching penmanship by mail over 20 years. I know that any ambitious person can master penmanship just as quickly and thoroughly by my system at home as if in a schoolroom under the personal instruction of the teacher.

BEGIN NOW to learn good handwriting and be ready for the next better position that comes your way. Learn right at home—in your own room, outside of working hours. Your spare time is all I ask.

I teach *Spelling, Letter Writing* and *Gregg Shorthand* also.

F. W. TAMBLYN

418 Ridge Bldg., KANSAS CITY, MO., U.S.A.

This Brings FREE BOOK

F. W. TAMBLYN, 418 Ridge Bldg., KANSAS CITY, MO.

I am interested in improving my penmanship. Send me your Free Book, "How to Become a Good Penman," postpaid.

Name.....

Address.....

BOYS

Learn Drafting

Employers everywhere are looking for skilled draftsmen. They are offering good salaries to start with splendid chances for advancement.

Drafting offers exceptional opportunities to a young man because drafting itself not only commands good pay, but it is the first step toward success in Mechanical or Structural Engineering or Architecture. And drafting is just the kind of work a boy likes to do. There is an easy delightful way in which you can learn right at home in spare time. For 27 years the International Correspondence Schools have been giving boys just the training they need for success in Drafting and more than 200 other subjects. Thousands of boys have stepped into good positions through I. C. S. help, but never were opportunities so great as now.

Let the I. C. S. help *you*. Choose the work you like best in the coupon, then mark and mail it. This doesn't obligate you in the least and will bring you information that may start you on a successful career. This is your chance. Don't let it slip by. Mark and mail this coupon now.

TEAR OUT HERE

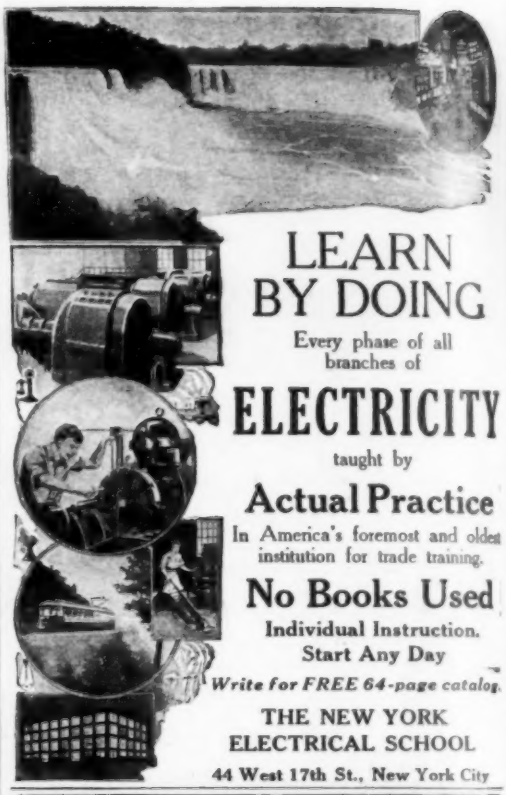
INTERNATIONAL CORRESPONDENCE SCHOOLS
BOX 5554B, SCRANTON, PA.

Explain, without obligating me, how I can qualify for the position, or in the subject, *before* which I mark X.

- ☐ MECHANICAL DRAFTING
- ☐ STRUCTURAL DRAFTING
- ☐ SHIP DRAFTING
- ☐ ELECTRICAL DRAFTING
- ☐ ARCHITECTURAL DRAFTING
- ☐ SHEET METAL DRAFTING
- ☐ BOILERMAKER DRAFTING
- ☐ BRIDGE DRAFTING
- ☐ MACHINE DESIGN
- ☐ ELECTRICAL ENGINEER
- ☐ Electric Lighting and Railways
- ☐ Electric Wiring
- ☐ Telegraph Engineer
- ☐ Telephone Work
- ☐ MECHANICAL ENGINEER
- ☐ Machine Shop Practice
- ☐ Gas Engine Operating
- ☐ CIVIL ENGINEER
- ☐ Surveying and Mapping
- ☐ STATIONARY ENGINEER
- ☐ Marine Engineer
- ☐ ARCHITECT
- ☐ Contractor and Builder
- ☐ Concrete Builder
- ☐ Structural Engineer
- ☐ SALESMANSHIP
- ☐ ADVERTISING
- ☐ Show Card Writer
- ☐ Sign Painter
- ☐ ILLUSTRATING
- ☐ Cartooning
- ☐ BOOKKEEPER
- ☐ Stenographer and Typist
- ☐ Cert. Public Accountant
- ☐ TRAFFIC MANAGER
- ☐ Railway Accountant
- ☐ GOOD ENGLISH
- ☐ Teacher
- ☐ Common School Subjects
- ☐ Mathematics
- ☐ CIVIL SERVICE
- ☐ Railway Mail Clerk
- ☐ AUTOMOBILE OPERATING
- ☐ Auto Repairing
- ☐ PLUMBING AND HEATING
- ☐ Textile Overseer or Supt.
- ☐ CHEMIST
- ☐ Navigation
- ☐ AGRICULTURE
- ☐ Poultry Raising
- ☐ Spanish
- ☐ French
- ☐ Italian

Name_____
Present Occupation_____
Street and No._____
City_____ State_____

Canadians may send this coupon to International Correspondence Schools, Montreal, Canada



LEARN BY DOING

Every phase of all branches of

ELECTRICITY

taught by

Actual Practice

In America's foremost and oldest institution for trade training.

No Books Used

Individual Instruction. Start Any Day

Write for FREE 64-page catalog.

THE NEW YORK ELECTRICAL SCHOOL
44 West 17th St., New York City

SHORTHAND IN 30 DAYS

Boyd Syllabic System—written with only nine characters. No "positions"—no "ruled lines"—no "shading"—no "word-signs"—no "code notes." Speedy, practical system that can be learned in 30 days of home study, utilizing spare time. For full descriptive matter, free, address—
Chicago Correspondence Schools, 909 Unity Building, Chicago, Ill.

POPULARITY FOLLOWS THE UKULELE

If you play quaint, dreamy Hawaiian music or latest songs on the Ukulele you will be wanted everywhere. We teach by mail 20 simple lessons; give you free a genuine Hawaiian Ukulele, music, everything—no extras. Ask us to send the story of Hawaiian music. You will love it. No obligation—absolutely free.

The Hawaiian Institute of Music, 1400 Broadway, Suite 706, New York, N. Y.

You can be quickly cured, if you

STAMMER

Send 10 cents coin or stamps for 70-page book on Stammering and Stuttering, "Its Cause and Cure." It tells how I cured myself after stammering for 20 years.
Benjamin N. Bogue, 705 Bogue Building, Indianapolis

LANGUAGES QUICKLY LEARNED ON ALL PHONOGRAPHS

"Like learning a tune—and just as easy. Our Lessons repeat the correct accent and pronunciation until you know it. Children, family, friends enjoy language study by ear."

LANGUAGE PHONE METHOD
and Rosenthal's Practical Linguistry

War has created unlimited opportunities for those who know languages. Prepare now to better your position or increase your business. Used and recommended by educators and leading colleges. Write for Booklet and Free Trial Offer.
The Language Phone Method, 961 Putnam Bldg., 2 W. 45th St., N. Y.

ARE YOU MECHANICALLY INCLINED?

LEARN A TRADE

—SWEENEY Auto and Tractor Trade

PAYS FROM

$150.00 to $400.00

MONTHLY

THE great Sweeney School is preparing men to earn from $150.00 to $400.00 a month in the Automobile and Tractor business. You owe it to yourself to investigate what there is in this wonderful business for you. You owe it to yourself to find out what the Sweeney School can do for you.

MOTOR EXPERTS
EARN $125.00 AND UP A MONTH

No Previous Experience Needed

If you like machinery, you can become an expert mechanic by the Sweeney System of Practical Training. It is not necessary that you have book learning. You don't need to be other than ambitious, industrious and willing. The Sweeney System means **Learn by Doing.** You don't study out of books or listen to lectures in the Sweeney School. From your first day to the last you work on all types of gas engines from a stationary engine to an airplane motor and from a 1-cylinder to a 12-cylinder. You do the actual work yourself. You get the actual experience on the finest and latest equipment and you find real pleasure in your work because each day you can see your progress.

TIRE VULCANIZING
$125.00 AND UP A MONTH

Sweeney System Trains You in 8 Weeks

By the Sweeney System, you can learn the business in 8 weeks. Don't say—it can't be learned in that time. 5,000 U. S. Army students were trained in that time for the Government at the Sweeney School. You work on the same wonderful equipment and under the same expert instructors as the soldiers did. If you are made of the right stuff, you can learn it too.

WELDING EXPERT
$150.00 AND UP A MONTH

A Great Harvest of Big Paying Positions for Sweeney Trained Men

Sweeney trained mechanics are in immense demand everywhere. When anyone wants a crack mechanic, they call on Sweeney. My graduates always get the top salaries because they absolutely know their business. When a man graduates from the Sweeney School he doesn't have to go out and get some experience before he lands a good job. A Sweeney graduate is a top-notcher from the word "go." There is a reason, too. It is the same reason why professional men choose Harvard and Yale Universities in preference to others. The Sweeney School is a leader in its field. That's why the Sweeney School has a constantly increasing enrollment.

E. J. SWEENEY, President

SWEENEY SCHOOL AUTO—TRACTOR AVIATION

THE MILLION DOLLAR TRADE SCHOOL

Dept. 306, Sweeney Bldg.
Union Station Plaza

Kansas City, Mo.

WRITE FOR MY BEAUTIFUL FREE CATALOG AT ONCE

THAT'S the first step on the road to success. Clip the coupon in the corner, fill it out and mail it to me at once. I will gladly send you my 72-page illustrated catalog free. Also a free copy of the Sweeney School News, a most interesting monthly school paper published here. You will enjoy them. Read the worth while stories of men like yourself who climbed out of the rut, came to Sweeney's and found success. Read how Frank Powell and Harry Wilson built up a $20,000 business in about two years after graduating. Read how George Stevens rose from a cowboy to an Auto expert in six weeks and how Elbert A. Pence built up a $25,000 yearly garage business at Clearmont, Mo. These stories and many more are told by Sweeney Students. Also I want you to learn how my students enjoy themselves after work in the heated Swimming Pool, the Club and Reading Rooms, Gymnasium, etc. Send the coupon right now—this minute.

MAIL THIS COUPON

EMORY J. SWEENEY
President
Dept. 306, Sweeney Bldg.
Union Station Plaza,
KANSAS CITY, MO.

Please send me free, without any obligation on my part, your 72-page catalog and your Sweeney School News. Tell me of the opportunities in the Auto and Tractor Business.

Name.....

Postoffice.....

State.....

MAIL THIS COUPON

Draftsmen Earn $35 to $100 Weekly!

DRAWING

You Can Get this Big Pay

All you need is the new 1919 edition of the Cyclopedia of Drawing and a little of your spare time. The cost is only 7 cents a day. You learn at home and pay this small amount while learning. See the FREE EXAMINATION offer below.

Architectural and Mechanical DRAWING

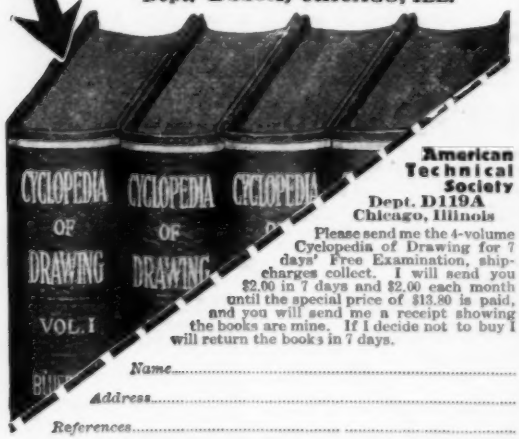
4 big volumes each 5½x8¼ in., bound in genuine American Morocco and trimmed in gold, 1578 pages and over 1000 illustrations, plates, diagrams and blue prints.

The only books that thoroughly cover Mechanical, Structural and Architectural Drawing in a non-technical way. You don't have to know anything about the subject to understand them. They begin at the beginning and tell you everything about Blue Print Reading—Mechanical Drawing—Machine Design—Machine Drawing—Structural Drafting—Architectural Drawing and Lettering—Shades and Shadows—Perspective Drawing; Freehand Drawing; Pen and Ink Rendering—Typographical Drafting—Drawing Instruments and Their Uses and hundreds of other things connected with the work.

Use One Week FREE

You can use these books for a whole week free without sending one cent. Just send the coupon below and all 4 volumes will come to you at once by express collect. Use them as if they were your own—go through them thoroughly and send them back at our expense if you don't want to keep them. If you do keep the books send us only $2.00. You can send the balance of our special introductory price—only $13.80 the same way—**$2.00 each month.** REMEMBER you don't take any chances. The risk is all ours and the benefits will all be yours. SEND THE COUPON TODAY.

American Technical Society
Dept. D119A, CHICAGO, ILL.



American Technical Society
Dept. D119A
Chicago, Illinois

Please send me the 4-volume Cyclopedia of Drawing for 7 days' Free Examination, ship-charges collect. I will send you $2.00 in 7 days and $2.00 each month until the special price of $13.80 is paid, and you will send me a receipt showing the books are mine. If I decide not to buy I will return the books in 7 days.

Name.....

Address.....

References.....

Please Mention Popular Mechanics

There is a Master Key

Which can unlock the secret chambers of success; can throw wide the doors which seem to bar men from the treasure house of nature; it is for those who are wise enough to understand, broad enough to weigh the evidence and firm enough to follow their own judgment. This may seem to be too good to be true, but when you remember that by the touch of a button or the turn of a lever, science has placed almost infinite resources at the disposal of man, it is evident that there may be still other resources not generally known, but which contain even greater possibilities. One writer says: *"I have found the Master Key and with it each day am unlocking the storehouse of wisdom and success of which I was heretofore utterly ignorant."* Another says: *The Master Key is too modest a title for such a stupendous revelation."* If you wish to add an asset of inestimable value to your resources, get the Master Key. It will be sent without cost or obligation of any kind.

CHARLES F. HAANEL
414 Granite Building ST. LOUIS, MO.

ELECTRICAL ENGINEERING IN ONE YEAR

training again open to civilians. Over 3000 men trained for electrical industries in experience of more than a quarter of a century. For men of ambition and limited time. Condensed course in Electrical enables graduates to secure good positions and promotions. Theoretical and Practical Electricity, Mathematics, Steam and Gas Engines, Mechanical Drawing. Students construct dynamos, install wiring and test electrical machinery. Course with diploma, complete

Thoroughly equipped fireproof dormitories, dining hall, laboratories shops.

Write for catalog. 27th year opens October 1, 1919.

BLISS ELECTRICAL SCHOOL
104 Takoma Avenue, WASHINGTON, D.C.

STAMMER

If you stammer attend no stammering school till you get my big new FREE book and special rate. Largest and most successful school in the world curing all forms of defective speech by advanced natural method. Write today. **North-Western School for Stammerers, Inc., 2317 Grand Ave., Milwaukee, Wis.**

WANTED MEN!

Prepare as Firemen, Brakemen, Electric Motormen, Colored Train Porters. $100-$150 month. No experience necessary. Hundreds placed. All Standard Roads. Chance quick promotion—$200-$300 month. Book—Application Blank FREE.

INTER-RAILWAY, Dept. M, Indianapolis, Ind.

NATIONAL TRADE DENTAL SCHOOL

506 S. Wabash Ave., CHICAGO, ILL.

LEARN MECHANICAL DENTISTRY—DEMAND UNLIMITED

Earn $1200 to $4000 yearly in mechanical dentistry. A big and grow[illegible] everywhere for mechanical dentists—like a gold mine, unexplored. A[illegible] school any time of the day or evening; be taught individually and lear[illegible] tual practice, without book study. Our System, the most complete in the [illegible] is used exclusively in this school. We are constantly called upon to [illegible] salaried positions. Why not qualify for one? Be fair to yourself; find [illegible] about exceptional opportunity we offer. Visit the school or write for [illegible]

"I Got the Job!"

"I'm to be Manager of my Department starting Monday. The boss said he had been watching all the men. When he found I had been studying at home with the International Correspondence Schools he knew I had the right stuff in me—that I was bound to make good. Now we can move over to that house on Oakland Avenue and you can have a maid and take things easy. I tell you, Nell, taking that course with the I. C. S. was the best thing I ever did."

Spare-time study with the I. C. S. is winning promotions for thousands of men and bringing happiness to thousands of homes all over the world. In offices, shops, stores, mines, mills and on railroads, I. C. S. trained men are stepping up to big jobs, over the heads of older men, past those whose only qualification is long service.

There is a job ahead of *you* that some man is going to be picked for. The boss can't take chances. When he selects the one to hold it he is going to choose a trained man with sound, practical knowledge of the work. Get busy right now and put yourself in line for that promotion. You can do it in spare time in your own home through the International Correspondence Schools, just as nearly two million men have done in the last twenty-five years, just as more than 100,000 men are doing today.

The first step these men took was to mark and mail this coupon. Make *your* start the same way—and make it right now.

INTERNATIONAL CORRESPONDENCE SCHOOLS
Scranton, Pa. Montreal, Can.

TEAR OUT HERE

INTERNATIONAL CORRESPONDENCE SCHOOLS
BOX 5553B, SCRANTON, PA.

Explain, without obligating me, how I can qualify for the position, or in the subject, *before* which I mark X.

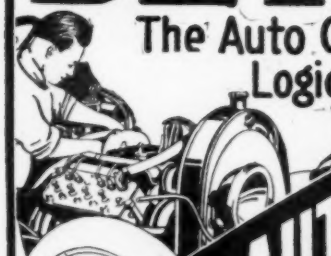
- ☐ ELECTRICAL ENGINEER
- ☐ Electric Lighting and Railways
- ☐ Electric Wiring
- ☐ Telegraph Engineer
- ☐ Telephone Work
- ☐ MECHANICAL ENGINEER
- ☐ Mechanical Draftsman
- ☐ Machine Shop Practice
- ☐ Gas Engine Operating
- ☐ CIVIL ENGINEER
- ☐ Surveying and Mapping
- ☐ MINE FOREMAN OR ENGINEER
- ☐ Metallurgist or Prospector
- ☐ STATIONARY ENGINEER
- ☐ Marine Engineer
- ☐ Ship Draftsman
- ☐ ARCHITECT
- ☐ Contractor and Builder
- ☐ Architectural Draftsman
- ☐ Concrete Builder
- ☐ Structural Engineer
- ☐ PLUMBING AND HEATING
- ☐ Sheet Metal Worker
- ☐ Textile Overseer or Supt.
- ☐ CHEMIST
- ☐ SALESMANSHIP
- ☐ ADVERTISING
- ☐ Window Trimmer
- ☐ Show Card Writer
- ☐ Sign Painter
- ☐ Railroad Trainman
- ☐ ILLUSTRATING
- ☐ Cartooning
- ☐ BOOKKEEPER
- ☐ Stenographer and Typist
- ☐ Cert. Public Accountant
- ☐ TRAFFIC MANAGER
- ☐ Railway Accountant
- ☐ Commercial Law
- ☐ GOOD ENGLISH
- ☐ Teacher
- ☐ Common School Subjects
- ☐ Mathematics
- ☐ CIVIL SERVICE
- ☐ Railway Mail Clerk
- ☐ AUTOMOBILE OPERATING
- ☐ Auto Repairing
- ☐ Navigation
- ☐ AGRICULTURE
- ☐ Poultry Raising
- ☐ Spanish
- ☐ French
- ☐ Italian

Name_____
Present Occupation_____
Street and No._____
City_____ State_____

Canadians may send this coupon to International Correspondence Schools, Montreal, Canada

DETROIT

The Auto Center is the Logical Place To



LEARN AUTO AND TRACTOR BUSINESS

The Auto, Truck and Tractor business offers the greatest opportunities for ambitious men.

There are more than six million automobiles in use as well as thousands of trucks and thousands of tractors. These machines are needing constant attention. Trained, competent men are in demand in every section of the globe. There are opportunities in every town at good, big salaries for men who know. Garages are needed and can be started on small capital. You can learn this business in a few weeks and get a job at once or be successful in business for yourself. But learn in Detroit, the Auto Center, at the Michigan State Auto School. Detroit is the automobile center of the world. It is the Heart of the Industry. You get all the benefit of this. In no other city can you get such advantages. Factories need trained, competent men everywhere, at the factories, in service stations, garages and as traveling service men, and they help our graduates obtain best locations for garages and assist when our graduates want to sell cars.

EARN $100 to $400 PER MONTH

We can teach you in a few short weeks to handle any auto or tractor proposition. You learn to repair any car that comes along. Our garage repair shop has from twenty to thirty-five cars for you to work on. Different cars go and come every day—you get regular garage experience. In our block test department alone, we have twenty-five different types of motors for you to work on. We have absolutely the best equipment obtainable.

Own a Garage—Do Repairing

Hundreds of our graduates are in business for themselves, repairing cars and are making from $2,500 to $10,000 and more a year. They went into a business on a small capital and succeeded because they knew the business thoroughly. There are thousands of opportunities open today right in your own town. You, too, can succeed if you let us train you. You can do more jobs if you know just how to locate the trouble quickly.

SELL AUTOMOBILES—TRUCKS—TRACTORS

Deal in new and used machines. Everyone has been making big money for three or four years. Farmers have obtained big prices. Everyone wants an auto, needs a truck or tractor and has the money to pay for it. You should know the business thoroughly before you enter the selling end of it. The used machine field is unlimited and you lose money if you **do not know** how to judge used machines. Then too you can give service properly if you **know** how.

Get Job in Factory, Garage or Service Station

Factories are constantly asking for men at big wages. They want trained men, and are eager to have **our graduates.** Garages write us for our men. Factories need men all over the world in service stations and as traveling service men. These men **must** be able to locate trouble **at once** and our men are in constant demand. Then too our graduates who have gone into business for themselves ask us for graduates, for they **know** we train them right. We assist in getting graduates just what they want.

FACTORIES ENDORSE OUR SCHOOL

The leading automobile factories in Detroit and other cities endorse our school, our equipment and our methods of teaching. They endorse the good work we are doing, in fact they assisted us in outlining our course and they have included lectures on practical theory in the courses, knowing that you cannot learn the business properly without them. You must train the head to guide the hand. Read some of their endorsements on this page. These were written in reply to letters from different parts of the country asking about us. We enjoy their keenest co-operation and you, as a student (here in Detroit, the auto center), get the benefit of it. This school is highly endorsed, and has a world-wide reputation for excellence.

FREE—NEW 176-PAGE CATALOG

133 illustrations showing our unexcelled equipment. Hundreds of letters from many of our 7,000 satisfied graduates from around the world. Dozens of letters from factories endorsing our school and methods. Fill in the coupon; get the "Auto School News" and New 176-Page Illustrated Catalog. All absolutely free.

A. G. ZELLER, President

Michigan State Auto School

The Old Reliable School **Automobiles — Trucks — Tractors — Aeroplanes**

306 Auto Bldg., 687-89-91 Woodward Ave., DETROIT, MICH., U. S. A.

Read what the manufacturers say about the M. S. A. S.

MAXWELL MOTOR COMPANY
INCORPORATED
MANUFACTURERS OF AUTOMOBILES

DETROIT, MICH.

Mr. James Williams, 20 Lincoln St., Gloversville, N. Y.
Dear Sir:—Your letter of February 23rd, making inquiry regarding the Michigan State Auto School received.

Wish to say that this is one of the best schools in the country, and would not hesitate to recommend it to anyone who is desirous of learning the automobile business. It is a recognized institution among the automobile factories of this city.

We have a great many graduates from this school in our employ and every one has given entire satisfaction.

Trusting this information will be of benefit to you, we remain,

Very truly yours,
MAXWELL MOTOR COMPANY, Inc.
CHALMERS PLANT
H. H. LEE Supervisor Welfare and Labor.

Packard Motor Car Company
MADE IN AMERICA
DETROIT, MICH., U.S.A.

The Michigan State Auto School enjoys a very enviable reputation and is probably one of the best of its kind in the United States. I have no hesitation in recommending it in every particular. Yours very truly,
PACKARD MOTOR CAR COMPANY.

KING MOTOR CAR COMPANY
BUILDERS OF KING CARS
DETROIT, U.S.A.

Replying to a recent letter addressed to Mr. Artemas Ward making inquiry as to the reputation of the Michigan State Auto School, will say that as far as we know all Detroit Automobile manufacturers endorse the work they are doing.

It is managed very efficiently and they have been turning out some pretty good men for the automobile industry, and cannot see any reason why you should hesitate about taking a course with this Institution.

Yours very truly,
KING MOTOR CAR COMPANY.

INTERNATIONAL HARVESTER COMPANY OF AMERICA
CHICAGO

Your practice of co-operating with the factories is very commendable, for it brings together the biggest men and most successful ideas to be had.

We will gladly co-operate with the Michigan State Auto School through our ninety branches in the United States in placing your tractor graduates. There is a constant demand for competent trained tractor men at very good wages. Very truly yours,
INTERNATIONAL HARVESTER COMPANY OF AMERICA.

HUDSON MOTOR CAR COMPANY
DETROIT, MICH., U.S.A.

The Michigan State Auto School, in our opinion, is the finest institution of its kind in the country. So far as we are aware, its course of instruction is thorough, comprehensive and practical. In fact, we endorse its method of tuition.

We have recommended a great many students to them and the results were very satisfactory.

Yours very truly,
HUDSON MOTOR CAR COMPANY.

Open a Garage

of your own

EARNS $520.00 PER MONTH

This is the type of garages our graduates are opening all over the country. They are needed in every locality.

C. F. Swanson of Sioux City, Iowa, is making $520.00 per month repairing and selling new and used cars. You can do the same. There are wonderful opportunities for small garages. Over six million cars to repair and resell, with another million and a half new cars coming out this year.

Big Demand for Detroit Trained Men

We have more calls for trained men at big salaries than we can supply—factories ask us daily for men. Telegrams come from factories and garages all over the U. S. A. asking for Detroit trained men. Think what it means to learn at the M. S. A. S. in the heart of the industry. This school with its world-wide reputation backs up its graduates after they leave. Detroit trained men get preference every time. People prefer "Detroit Trained Men," just as they prefer Detroit stoves or any other commodity for which Detroit is famous. And don't forget they are willing to pay more for the Detroit Brand, whether it is a trained man or a stove or an automobile. The coming year will be the busiest the auto industry has ever known. Opportunities are unlimited. Get started now.

THESE ARE NEW TRACTORS JUST ADDED TO OUR TRACTOR DEPARTMENT

Complete Tractor Course Included in Auto Course

We have always maintained a thorough course of instructions in the care, repair and maintenance of tractors. We have steadily improved this course. It is now unequalled. We have the keen co-operation of three of the largest Tractor makers—International, Moline and Emerson-Brantingham. They have placed their tractors in the school for our students to study and use.

Courses Also in Brazing, Welding, and Tire Repairing

In addition to our general automobile course we give separate and complete courses on Brazing and Welding and on Tire Repairing. With over six million cars in use and four or five tires per car, there is a lot of money in repairing tires. Brazers and welders are getting $8.00 to $10.00 per day. Factories and garages are always looking for these men, too.

NOT A ONE MAN SCHOOL

This school is founded on the best, most practical and newest principles in the Automobile, Truck, Aeroplane and Tractor business. It is the result of the keenest co-operation with manufacturers, service stations, garages and owners. It is not one man's idea, but the ideas of the biggest, best, and most successful men in each field.

A. G. Zeller, President

Learn in Detroit—Start Any Time

Detroit trained men get preference and get jobs quickly. No other city can give what Detroit does with its more than 184 large Auto and accessories factories. Think what it means to learn in the Michigan State Auto School. 71% of automobiles are made in Detroit. You are right in the Heart of the Auto Industry. We have a Sprague Electric Dynamometer for Block-testing purposes for students' use. School open all the year. Enter classes any time, any day. Three classes daily: morning, afternoon, evening. Instructors are members of The Society of Automotive Engineers (S. A. E.).

EARN WHILE YOU LEARN

If necessary we can secure work for you to help pay expenses while you are taking our courses.

USE THE COUPON NOW

Use the coupon, tell us when to expect you, jump on a train as hundreds have done and come to Detroit, the Auto Center and "learn the business right." If you can't come at once, we will send you absolutely FREE our new 176-page catalog and a copy of "Auto School News" just off the press. Mail the coupon NOW.

America's Most Progressive Auto School

MICHIGAN STATE AUTO SCHOOL

THE OLD RELIABLE SCHOOL — A. G. ZELLER, Pres.

AUTOMOBILES, TRUCKS, TRACTORS, AEROPLANES

306 Auto Building, 687-89-91 Woodward Avenue

DETROIT, MICH., U. S. A.

Money-Back Guarantee

We guarantee to qualify you for a position as chauffeur, repair man, tester, demonstrator, auto electrician, garage man, automobile dealer, Aeroplane motor mechanic or tractor mechanic and operator, paying from $100 to $400 monthly or refund your money.

SEND THIS COUPON TODAY

MICHIGAN STATE AUTO SCHOOL
306 Auto Bldg., 687-89-91 Woodward Ave.
DETROIT, MICHIGAN, U. S. A.

Gentlemen: Please send me, absolutely FREE, New 176-page Illustrated Catalog, "Auto School News," and information as checked below.

[ ] Auto and Tractor Course [ ] Tire Repairing [ ] Brazing and Welding [ ] Aeroplane Motor Mechanics.

(Mark each course you are interested in.)
Or, better still, you can expect me about

.....

Name .....

Street .....

City ..... State .....

Home Study
Business Courses

Do you want an important, high-salaried position? You can have one if you can do the work. LaSalle experts will show you how, guide you step by step to success and help solve your personal business problems. Our plan enables you to train during spare hours without interference with your present duties. Give us your name and address and mark with an "X" below the kind of position you want to fill. We will mail catalog and full particulars regarding our low cost monthly payment plan. Also our valuable book for ambitious men, "Ten Years' Promotion In One". Tear out and mail this advertisement today. No obligation to you. Let us prove to you how this step has helped thousands of ambitious men to real success.

Coupon

- ☐ BUSINESS ADMINISTRATION: Training for Official, Managerial, Sales and Executive positions in Business.
- ☐ HIGHER ACCOUNTANCY: Training for positions as Auditors, Comptrollers, Certified Public Accountants, Cost Accountants, etc.
- ☐ BUSINESS LETTER-WRITING: (New Course) Training for positions as House Correspondents, Supervisors of Correspondence, Mail Sales Directors, Correspondence Critics, Letter Executives; and in the handling of all special correspondence (credits, collections, sales, adjustments, etc.) in which expert letter writing ability is required.
- ☐ INTERSTATE COMMERCE AND RAILWAY TRAFFIC: Training for positions as Railroad and Industrial Traffic Managers, Traffic Experts, etc.
- ☐ LAW: Training for admission to bar and executive-business positions requiring legally-trained men. Degree of LL. B. conferred.
- ☐ BANKING AND FINANCE: Training for Executive positions in Banks and Financial Institutions, Tellers, Cashiers, Trust Officers, Financial Managers, etc.
- ☐ BUSINESS ENGLISH: Training for positions as Business Correspondents, Business Literature and Copy Writers.
- ☐ COMMERCIAL SPANISH: Training for positions as Foreign Correspondent with Spanish-Speaking Countries.
- ☐ EFFECTIVE PUBLIC SPEAKING: Training in the art of forceful, effective speech—Ministers, Salesman, Fraternal Leaders, Politicians, etc.
- ☐ BOOKKEEPING: Training for Expert Bookkeeping Positions.

LaSalle Extension University
"The World's Greatest Extension University"
Dept. 664-R Chicago, Illinois

(Name) .....
(Address) .....
(Present Position) .....

Please Mention Popular Mechanics

Does Your Hand Itch for a Pencil?

IF your hand itches for a pencil you may have in you the making of a great cartoonist. You do not have to be a genius. If you have a liking for drawing and develop it intelligently, there are many opportunities for you in this profitable profession.

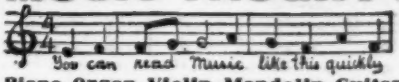
Through the Federal Course in Applied Cartooning, America's 32 greatest cartoonists will help you succeed. Among these men are Clare Briggs, J. T. McCutcheon, Sidney Smith, and Fontaine Fox. They show you by examples how they began and what were their stepping stones to success.

"A Road To Bigger Things" Free

This interesting book contains studio pictures of the members of the Federal Staff and describes the Federal Course in detail. Write now for your free copy to:

FEDERAL SCHOOL OF APPLIED CARTOONING
963 Warner Bldg. Minneapolis, Minn.

MUSIC TAUGHT FREE



IN YOUR OWN HOME

Piano, Organ, Violin, Mandolin, Guitar, Banjo, etc.

Beginners or advanced players. One lesson weekly. Illustrations make everything plain. Only expense about 2c per day to cover cost of postage and music used. Write for **FREE** booklet which explains everything in full.

AMERICAN SCHOOL OF MUSIC, 51 Lakeside Building, CHICAGO

Be a Finger Print Expert

Police departments, factories and industries everywhere are adopting this system of identification. Experts needed at once. You can train yourself in spare time at home. Write for details.

Free Book—Write Valuable and interesting book on finger prints sent absolutely free and prepaid. Also details of special limited offer. Write at once, while this offer lasts.

UNIVERSITY OF APPLIED SCIENCE
Desk A119, 1772 Wilson Avenue, CHICAGO

CIVIL SERVICE

positions are in all parts of the country. Good pay, steady work, life positions, congenial surroundings, promotions on merit, short hours, annual vacation and sick leave with pay. Many thousands appointed yearly. Both sexes. No political pull. Nearly 300,000 classified positions. Common school education sufficient. Full information and questions used by the Civil Service Commission free.

COLUMBIAN CORRESP. COLLEGE, WASHINGTON, D. C.

$90 to $250 a Month
Free Book Tells How

Write today for this big, new Free Book on

SIGNAL ENGINEERING

Railroads need men for this important work. Big positions open throughout U. S. Big Free Book tells all about it, how you get exact training you need. Write—today.

Dept. of Signaling, Room A119 1810 Wilson Ave., Chicago

Make Your Mind a File—Not a Pile—Stop Forgetting

PROF. HENRY DICKSON, *America's foremost Authority on Memory Training and Principal of the Dickson Memory School, Hearst Bldg., Chicago*

By Prof. Henry Dickson

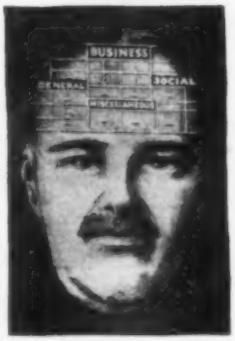
IS your mind like a scrap pile—heaped up with a lot of unrelated, unclassified, unindexed facts? When you want to remember a name, place or date, must you grope uncertainly in this mixed-up pile seeking in vain to locate the desired information? And finally, in embarrassment, give it up? Summoned on any occasion to give facts and figures—does your mind become a blank? When suddenly called upon to speak—do you seek wildly to collect your thoughts—utter a few commonplace remarks—and sit down—humiliated? *Without Memory, all the knowledge in the world becomes worthless. "Stop Forgetting" makes your mind a file—not a pile.*

Perfect Your Memory and You Can Command What Salary You Will

ever before. Every man in every place will find a reliable, efficient memory an asset of the utmost value. Whatever may be your position, send now for information.

DICKSON MEMORY TRAINING HAS HELPED THOUSANDS

Mail coupon or send postal for statements from students who had exceedingly poor memories and developed them to perfection—and men with remarkably good memories, who made them even better. Give me 10 minutes daily and I will make your mind an infallible classified index, from which you can instantly select facts, figures, names, faces, arguments.



The Dickson Trained mind is as well ordered as a cross-indexed file

The average mind resembles a scrap pile

I CAN MAKE YOUR MIND AS SYSTEMATIC AND FORGET-PROOF AS A CARD INDEX FILE

—master of your mind's infinite ramifications—instead of a victim of its disordered details. My course of Memory Training perfected by 20 years' experience, is universally recognized as the most thorough, practical and simplest system of its kind now before the public. My system so thoroughly trains the memory that you will be able to classify impressions, ideas, names, facts and arguments and have them ready at a moment's notice. It develops concentration—overcomes selfconsciousness, bashfulness—enables you to address an audience intelligently without notes.

IMPORTANT NOW

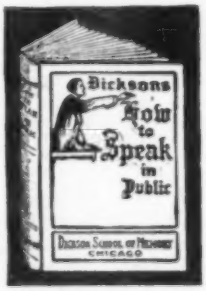
No time has been more opportune than the present to train the memory and the powers of concentration. Business from now on will be more intensive than

SPECIAL OFFER ON "HOW TO SPEAK IN PUBLIC

This de luxe, handsomely illustrated, richly bound book—regularly priced at $2—free to every student who enrolls. The book will train you to think on your feet—to express yourself clearly, logically and convincingly, whether talking to one person or a thousand.

GET MY BOOK ON "HOW TO REMEMBER"

Simply send your name and address on the coupon or postal for this remarkable book. I will also send you a free copy of my unique copyrighted Memory Test.



Prof. Henry Dickson, Principal
Dickson School of Memory, 1735 Hearst Bldg., Chicago, Ill.

Send me your Free Book "How to Remember," also particulars how to obtain a free copy of Dickson's "How to Speak in Public," also remarkable Memory Test free.

Name.....

Street.....

City.....State.....

Learn Watchwork, Jewelrywork and Engraving. A fine trade commanding a good salary, and your services are always in demand. Address HOROLOGICAL, Dept. P, Bradley Institute, Peoria, Ill., for our latest catalog.

Be an Artist

Comics, Cartoons, Commercial, Newspaper and Magazine Illustrating, Pastel Crayon Portraits and Fashions. Earn money; become famous. Our simple method quickly develops your talent in spare time. **By Mail or Local Classes.** Write for terms and list of successful students.
ASSOCIATED ART STUDIOS
87-D Flatiron Building NEW YORK

What 15c will bring You from the Nation's Capital

Washington, the home of the Pathfinder, is the nerve-center of civilization; history is being made at this world capital. The Pathfinder's illustrated weekly review gives you a clear, impartial and correct diagnosis of public affairs during these strenuous, epoch-making days.

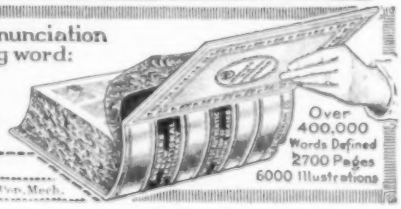
The little matter of **15c** in stamps or coin will bring you the Pathfinder **13** weeks on trial. The Pathfinder is an illustrated weekly, published at the Nation's center, for the Nation; a paper that prints all the news of the world and tells the truth and only the truth; now in its **26th** year. This paper fills the bill without emptying the purse; it costs but $1 a year. If you want to keep posted on what is going on in the world at the least expense of time or money, this is your means. If you want a paper in your home which is sincere, reliable, entertaining, wholesome, the Pathfinder is yours. If you would appreciate a paper which puts everything clearly, fairly, briefly—here it is. Send **15c** to show that you might like such a paper and we will send the Pathfinder on probation **13** weeks. The 15c does not repay us, but we are glad to invest in new friends. Address:

The Pathfinder, Box 508, Washington, D. C.

WEBSTER'S NEW INTERNATIONAL DICTIONARY

Whatever your question;—be it the pronunciation of Cantonment; the spelling of a puzzling word: the location of Zeebrugge, the meaning of blighty, ace, tank, etc., this Supreme Authority contains an accurate, final answer.

G. & C. MERRIAM CO., SPRINGFIELD, MASS. REGULAR AND INDIA-PAPER EDITIONS



Please send me specimen pages and FREE POCKET MAPS { NAME ..... ADDRESS ..... Pop. Mech.

"Here's an Extra $50!

"I'm making *real* money now! Yes, I've been keeping it a secret until pay day came. I've been promoted with an increase of $50 a month. And the first extra money is yours. Just a little reward for urging me to study at home. The boss says my spare time training has made me a valuable man to the firm and there's more money coming soon. We're starting up easy street, Grace, thanks to you and the I. C. S."

Today more than ever before, money is what counts. You can't get along on what you have been making. Somehow, you've simply got to increase your earnings.

Fortunately for you there is an unfailing way to do it. Train yourself for bigger work, learn to do some one thing well and employers will be glad to pay you real money for your special knowledge.

You can get the training that will prepare you for the position you want in the work you like best, whatever it may be. You can get it at home, in spare time, through the International Correspondence Schools.

It is the *business* of the I. C. S. to prepare men for better positions at better pay. They have been doing it for 27 years. They have helped two million other men and women. They are training over 100,000 now. And they are ready and anxious to help *you*.

Here is all we ask—without cost, without obligating yourself in any way, simply mark and mail this coupon.

TEAR OUT HERE

INTERNATIONAL CORRESPONDENCE SCHOOLS

BOX 5557B, SCRANTON, PA.

Explain, without obligating me, how I can qualify for the position, or in the subject, *before* which I mark X.

- ☐ ELECTRICAL ENGINEER
- ☐ Electric Lighting and Railways
- ☐ Electric Wiring
- ☐ Telegraph Engineer
- ☐ Telephone Work
- ☐ MECHANICAL ENGINEER
- ☐ Mechanical Draftsman
- ☐ Machine Shop Practice
- ☐ Toolmaker
- ☐ Gas Engine Operating
- ☐ CIVIL ENGINEER
- ☐ Surveying and Mapping
- ☐ MINE FOREMAN OR ENGINEER
- ☐ STATIONARY ENGINEER
- ☐ Marine Engineer
- ☐ Ship Draftsman
- ☐ ARCHITECT
- ☐ Contractor and Builder
- ☐ Architectural Draftsman
- ☐ Concrete Builder
- ☐ Structural Engineer
- ☐ PLUMBING AND HEATING
- ☐ Sheet Metal Worker
- ☐ Textile Overseer or Supt.
- ☐ CHEMIST
- ☐ SALESMANSHIP
- ☐ ADVERTISING
- ☐ Window Trimmer
- ☐ Show Card Writer
- ☐ Sign Painter
- ☐ Railroad Trainman
- ☐ ILLUSTRATING
- ☐ Cartooning
- ☐ BOOKKEEPER
- ☐ Stenographer and Typist
- ☐ Cert. Public Accountant
- ☐ TRAFFIC MANAGER
- ☐ Railway Accountant
- ☐ Commercial Law
- ☐ GOOD ENGLISH
- ☐ Teacher
- ☐ Common School Subjects
- ☐ Mathematics
- ☐ CIVIL SERVICE
- ☐ Railway Mail Clerk
- ☐ AUTOMOBILE OPERATING
- ☐ Auto Repairing
- ☐ Navigation
- ☐ AGRICULTURE
- ☐ Poultry Raising
- ☐ Spanish
- ☐ French
- ☐ Italian

Name_____

Present Occupation_____

Street and No._____

City_____ State_____

Canadians may send this coupon to International Correspondence Schools, Montreal, Canada

Please Mention Popular Mechanics

WRITERS' FREE BOOK!

A Wonderful Book — Read About It!

Tells how easily Stories and Plays are conceived, written, perfected, sold. How many who don't DREAM they can write, suddenly find it out. How the Scenario Kings and the Story Queens live and work. How bright men and women, without any special experience, learn to their own amazement that their simplest Ideas may furnish brilliant plots for Plays and Stories. How your own Imagination may provide an endless gold-mine of Ideas that will bring you Happy Success and Handsome Cash Royalties. How new writers get their names into print. How to tell if you ARE a writer. How to develop your "story fancy," weave clever word-pictures and unique, thrilling, realistic plots. How your friends may be your worst judges. How to avoid discouragement, and the pitfalls of Failure. HOW TO WIN!

This surprising book is ABSOLUTELY FREE. No charge. No obligation. YOUR copy is waiting for you. Write for it NOW. Just address

Authors' Press
Dept. 35
Auburn, N. Y.

FREE

$20

UKULELE

Hawaiian Guitar, Violin, Mandolin, Guitar, Cornet or Banjo

Wonderful new system of teaching note music by mail. To first pupils in each locality we'll give a $20 superb Violin, Mandolin Ukulele, Guitar, Hawaiian Guitar, Cornet or Banjo absolutely free. Very small charge for lessons only expense. We guarantee success or no charge. Complete outfit free. Write at once—no obligation.

SLINGERLAND SCHOOL OF MUSIC, Dept. 470, CHICAGO, ILL.

LEARN WATCH REPAIRING

Be a watchmaker—you can learn this profitable trade by correspondence in a few weeks in your own home by the DeSelms Chart System. After you complete the course you will know a watch from A to Z. You will know just what the matter is and how to repair one. When you graduate you will be a practical watchmaker and repairer and competent to fill any position. Positions for our graduates.

Ask for our Free Book. It explains our system and terms.

THE DeSELMS WATCH SCHOOL
23 Perry Street ATTICA, INDIANA

SHORTHAND IN ONE MONTH

BOYD SYSTEM—Based on Syllables—

the Wonderful New Easy, Scientific System. Writers hold world's record, 100 to 150 words a minute in 30 days guaranteed. No "shading," no "word-signs." Dictation first week. Typewriting Free. Send today for Catalog and Money-Back Guarantee.

CHICAGO HOME STUDY SCHOOLS. 504 Reaper Block, Chicago, Ill.

GOV'T JOBS

Short hours. Easy work. No strikes. No hard times. Steady, lifetime positions, $75 to $150 a month to start. Quick promotion.

MEN WANTED!

If you are an American Citizen 18 or over write for FREE book that tells about these and many other wonderful advantages offered by U. S. Government. Railway Mail, Post Office, Custom House, Panama Canal and other divisions. Prepare under former Civil Service Secretary-Examiner. You can qualify. Write for FREE BOOK and Special 20 Day Offer NOW.

PATTERSON CIVIL SERVICE SCHOOL, 86 News Bldg., Rochester, N. Y.

Double Your Dollars With These Auto Books

THERE'S a good job with big pay waiting for men like you in the automobile engineering field. Men in other lines have doubled their earnings after learning auto repairing and construction work. Get into this fine, big-paying business now. You can learn it in your spare time—no apprenticeship to serve—good pay right from the start. Read below and find out how you can prepare yourself to hold one of these jobs at a cost of only 7 cents a day, without paying anything in advance.

Automobile Engineering

This 5-volume 1919 Library of Automobile Engineering will make an automobile expert out of you and fit you for the biggest kind of job. It contains 2500 pages and 2100 pictures, diagrams, etc., all substantially bound in genuine American Morocco and stamped in gold. Every part of practically every well known car is described and explained in them.

They begin right at the beginning and tell everything the expert knows. Telling what every part of a car is—what it does—what it is for—how to take care of it and repair it in the most modern approved way.

Here's a few of the thousand different things explained: Oxy-Acetylene Motors—Welding—Motor Construction and Repair—Carburetors and Settings—Valves—Cooling Systems—Lubrication—Fly-Wheels—Clutch—Transmission—Final Drive—Steering Devices—Frames—Tires—Vulcanizing—Ignition—Starting and Lighting Systems—Wiring Diagrams—Shop Kinks—Commercial Garage—Design and Equipment—Electrics—Storage Batteries—Care and Repair of Motorcycles—Trucks—Running a Public Garage—Auto Shop Work—Steam Cars.

Fifteen great automobile engineers wrote these books in the simplest kind of language so that you can understand them even though you may not know anything about a car now.

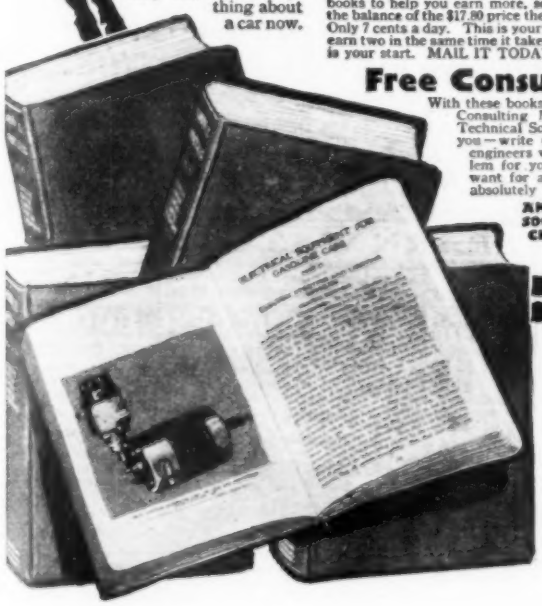
Use One Week FREE!

Mail the coupon for free examination. Don't send any money. We will ship the books (all 5 volumes) by express collect and you can have a whole week to use them as if they were your own. Give them every test you can think of. Take them to your shop. Show them to your friends and ship them back at our expense if you don't want to keep them. If you do keep the books to help you earn more, send us only $2.00. You can send the balance of the $17.80 price the same way—$2.00 each month. Only 7 cents a day. This is your chance to double your dollars—earn two in the same time it takes to get one now. The coupon is your start. MAIL IT TODAY.

Free Consulting Service

With these books goes free of all charge a $12.00 Consulting Membership in the American Technical Society. If any question puzzles you—write us. Our corps of experts and engineers will solve any automobile problem for you. Ask all the questions you want for a whole year. This service is absolutely FREE.

AMERICAN TECHNICAL SOCIETY, Dept. A119A CHICAGO, U.S.A.



1919 Edition

AMERICAN TECHNICAL SOCIETY
Dept. A119A CHICAGO, U. S. A.

Please send me the 5-volume set of Automobile Engineering for 7 days' examination, shipping charges collect. If I decide to buy I will send $2.00 within 7 days and balance at the rate of $2.00 a month until $17.80 has been paid. Then you will send me a receipt showing that the set of books and the Consulting Membership are mine and fully paid for. If I want to get along without the books, I will return them, after 7 days, at your expense.

Name .....

Address .....

Reference .....

Be a Traffic Man—Earn $50 to $150 Weekly

Learn Professional Traffic Management

Unusual Opportunities await trained men in this field. Business institutions everywhere are forced to seek the services of competent Traffic Men. Constantly changing conditions require trained men to understand and solve the problems that arise. Big salaries are paid to men who can overcome these difficulties. YOU can fit yourself to do this pleasant work and command a salary from $3,500 to $10,000 yearly.

TRAFFIC MANAGER

Pleasant Work—Easy to Learn

Spare time study—a few hours each week—will soon fit you to fill such a position. The work is easy, the surroundings pleasant and you become a man among big, successful men, with a private office, prestige—and **Success!** Positions are permanent and lead to bigger opportunities constantly.

R. R. TRAFFIC MEN

Our Course Highly Practical

Entire course of instruction given by practical, experienced, successful traffic men. Their counsel and advice come from their daily experience. They know the needs and requirements and they know the methods and information necessary to meet them, hence are amply fitted to successfully teach others. Each student gets personal attention. Practical assistance rendered for two years after graduation. An ordinary education, ambition and determination are all you need to win. An established Traffic Department at School furnishes practical experience, also offers opportunity for

TRAFFIC BUREAU

Your Success Depends on YOU!

Mere wishing and hoping will not bring results. You must **get action** if you would climb. The difference between "wages" and "salary" is in being able to do something the crowd can't do. Success is a matter of preparation—it doesn't "just happen." The man willing to pay the price of preparation gets the big salary. Get out of the rut! Don't drift. Be a winner, not a wisher—and loser. Give yourself a chance. Only one thing can stop you—that's **You.** A pleasant job at a big salary awaits you as a trained Traffic Man. Our free booklet "Traffic" gives full particulars—tells **How** you can "learn to earn the big salaries." The first step is to start—**Now!** Prove your ambition. Take a step for **Success.** Write **Today!**

Post Graduate Course Free

Students and graduates are privileged to use this feature without extra charge. Gives actual experience in rates, routing, classifications and packing. An exclusive feature not offered elsewhere.

TRAFFIC MANAGERS' salaries range from $3,000 to $25,000 yearly.

TRAFFIC BUREAUS earn from $2,000 to $10,000 yearly.

TRAFFIC SECRETARIES in Chambers of Commerce earn from $2,500 to $10,000 yearly.

Interstate Traffic School, 26 Traffic Bldg., Ft. Wayne, Ind.

BE AN ARTIST

We can teach you **DRAWING** in your own home during your spare time.

Our 18 years of successful teaching prove our ability. 10 Courses in Commercial and Illustrative Drawing. Teachers Normal and Applied Art. **Endorsed by high art authorities.** Students trained by members of our Faculty are filling high-salaried positions. Artist's Outfit **FREE** to Enrolled Students. Write today for Art Year Book.

OUR HANDSOME ART YEAR BOOK IS FREE TO YOU!

SCHOOL OF APPLIED ART

APPLIED ART BLDG. NO. 2 BATTLE CREEK MICH.

MEN WANTED!

THOUSANDS NEEDED AT ONCE

$35 to $75 A WEEK Become a Heating and Ventilating Engineer, and earn this big money.

Big Building operations all over the country calls for thousands of men in this profession. **LEARN AT HOME SPARE TIME.** Simplified, Guaranteed course of study soon fits you to step into big paying position. Now is the time to start. Write at once for particulars.

INTENSIVE TRAINING INSTITUTE, Box 708, Detroit, Mich.

LEARN HOW TO WRITE SHORT STORIES

There is a big demand for short stories, photoplays and feature articles. You can learn how to write at home in spare time. **Jack London said so.** He and other great writers have endorsed our course "How to Write"

Write For Free Book and full details of our Special Introductory Offer. This offer is limited. Write today.

Hoosier Institute, Short Story Dept. 115 Y. Ft. Wayne, Ind.

Music Lessons

UNDER MASTER TEACHERS

At Home

A Complete Conservatory Course By Mail

Wonderful home study music lessons under great American and European teachers. Endorsed by Paderewski. Master teachers guide and coach you. Lessons a marvel of simplicity and completeness.

Any Instrument or Voice Write telling us course you are interested in—Piano, Harmony, Voice, Public School Music, Violin, Cornet, Mandolin, Guitar, Banjo, or Reed Organ—and we will send our FREE CATALOG covering all instrumental and vocal courses. Send NOW.

University Extension Conservatory, 5721 Siegel-Myers Bldg., Chicago, Ill.

LEARN WATCHMAKING

and become independent. Good-paying positions secured. Easy to learn. Send for FREE CATALOG.

ST. LOUIS WATCHMAKING SCHOOL, Dept. 5, ST. LOUIS, MO.

FREE SUCCESS BOOKS

DOUBLE YOUR INCOME

They develop your mental power and efficiency. FREE CATALOG on request.

Advanced Thought Pub. Co., 159 N. State St., Dept. 605, Chicago

NEW SCIENTIFIC WONDER

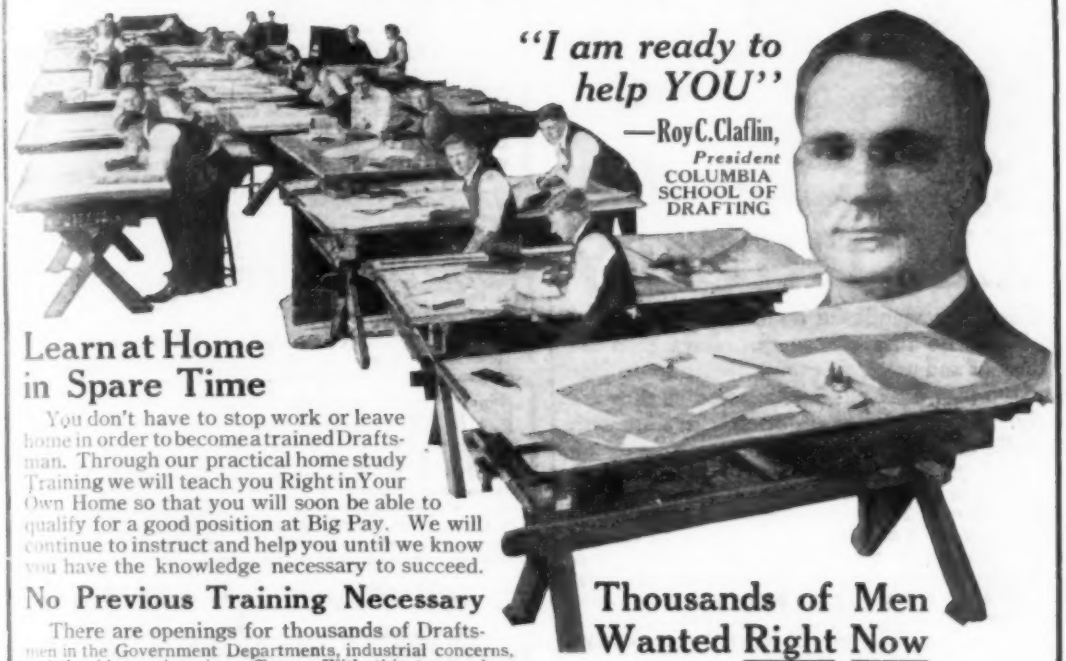
"X-RAY" CURIO

PRICE 12c COIN

BIG FUN BOYS You apparently see thru Clothes, Wood, Stone, any object. See Bones in Flesh. "A magic trick novelty *free* with each X Ray."

MARVEL MFG. CO., Dept. 47, NEW HAVEN, CONN.

Earn $35 to $100 a Week
As a Mechanical Draftsman



Learn at Home in Spare Time

You don't have to stop work or leave home in order to become a trained Draftsman. Through our practical home study Training we will teach you Right in Your Own Home so that you will soon be able to qualify for a good position at Big Pay. We will continue to instruct and help you until we know you have the knowledge necessary to succeed.

No Previous Training Necessary

There are openings for thousands of Draftsmen in the Government Departments, industrial concerns, and the big engineering offices. With this tremendous demand has come a big increase in salaries. The Columbia School of Drafting quickly qualifies you to accept a position as a Practical Draftsman.

Draftsmen Are Getting $35 to $100 a Week

with big chances for even better pay as the demand grows. By enrolling **NOW** for our practical Home Study Course in Drafting you can quickly qualify for a position as Draftsman and by properly applying the principles we teach

You Have a Chance to Become a Chief Draftsman

and get to the very top in this fascinating profession. Our course will give you just the knowledge you need to make good as Chief Draftsman when your chance comes.

Peace Calls for More Draftsmen

With the problems of reconstruction facing the nation, the demand for draftsmen is even Greater Than During the War. All big engineering, construction, and manufacturing projects must first go through the drafting room before the workman can commence. You can help in the work of reconstruction and secure a Big Salary with excellent opportunities for advancement. Prepare now and be ready when the demand reaches its height.

We Will Help You Secure a Position

as soon as you complete our course. We have already placed hundreds of our graduates in good paying positions and are constantly in touch with vacancies for which Draftsmen are Urgently Needed. Government Departments and Private Concerns are continually calling upon us for our graduates because they know that our instruction produces draftsmen of the caliber they need.

Thousands of Men Wanted Right Now

Drawing Outfit FREE

As soon as you enroll you will be sent our special drawing outfit to work with while taking the course. This set will be yours to keep after paying your tuition. You are not to return it after completing the course.

Illustrated Book of Particulars Sent Free

Fill in the coupon below—send it to us and we will send you FREE a copy of our illustrated book telling all about our practical Home Study Course and how you may secure our instruction at once on Easy Terms so as to quickly qualify as a Professional Draftsman.

Mail This Coupon Today

COLUMBIA SCHOOL of DRAFTING
Dept. 979, 14th and T Sts., N. W., WASHINGTON, D. C.

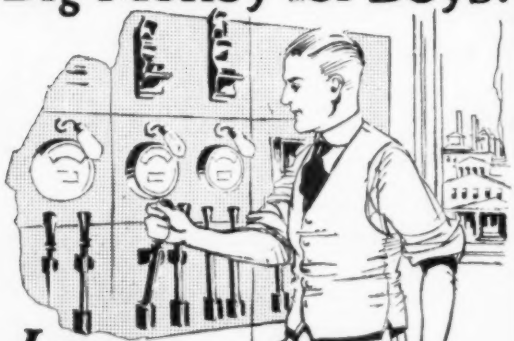
Without obligation to me, please send me your illustrated book telling how I can secure your complete Home Study Course, the Free Drawing Outfit, and your help in securing a position as Draftsman.

NAME .....

ADDRESS .....

CITY ..... STATE .....

Big Money for Boys!



Learn ELECTRICITY

There is a wonderful opportunity right now for boys who like electricity. Boys who are ambitious and will train themselves in spare time can step into positions just as soon as they are ready. Good salaries are offered to start with splendid chances for rapid promotion.

For 27 years the International Correspondence Schools have been training boys for success in electricity and over 200 other subjects. They will help you prepare right at home for a position in the line of electrical work you like best—or in any other work that appeals to you. Thousands of boys, through I. C. S. training, have stepped into fine jobs, but never were opportunities so great as now.

Let the I. C. S. help *you*. Choose the work you like best in the coupon below, then mark and mail it today. This doesn't obligate you in the least, and it will bring you information that may start you on a successful career. This is your chance. Don't let it slip by. Mark and mail this coupon *now*.

TEAR OUT HERE

INTERNATIONAL CORRESPONDENCE SCHOOLS
BOX 5555B, SCRANTON, PA.

Explain, without obligating me, how I can qualify for the position, or in the subject, *before* which I mark X.

- ☐ ELECTRICAL ENGINEER
- ☐ Electrician
- ☐ Electric Wiring
- ☐ Electric Lighting
- ☐ Electric Car Running
- ☐ Heavy Electric Traction
- ☐ Electrical Draftsman
- ☐ Electric Machine Designer
- ☐ Telegraph Expert
- ☐ Practical Telephony
- ☐ MECHANICAL ENGINEER
- ☐ Mechanical Draftsman
- ☐ Toolmaker
- ☐ Machine Shop Practice
- ☐ Gas Engineer
- ☐ CIVIL ENGINEER
- ☐ Surveying and Mapping
- ☐ MINE FOREMAN OR ENGINEER
- ☐ ARCHITECT
- ☐ Architectural Draftsman
- ☐ PLUMBING AND HEATING
- ☐ Sheet Metal Worker
- ☐ Ship Draftsman
- ☐ CHEMICAL ENGINEER
- ☐ SALESMANSHIP
- ☐ ADVERTISING MAN
- ☐ Show Card Writer
- ☐ Outdoor Sign Painter
- ☐ RAILROADER
- ☐ ILLUSTRATOR
- ☐ DESIGNER
- ☐ BOOKKEEPER
- ☐ Stenographer and Typist
- ☐ Cert. Public Accountant
- ☐ Traffic Management
- ☐ Commercial Law
- ☐ GOOD ENGLISH
- ☐ Common School Subjects
- ☐ CIVIL SERVICE
- ☐ Railway Mail Clerk
- ☐ STATIONARY ENGINEER
- ☐ Textile Overseer or Supt.
- ☐ AGRICULTURE
- ☐ Navigator
- ☐ Poultry Raising
- ☐ AUTOMOBILES
- ☐ Spanish
- ☐ French
- ☐ Italian

Name_____

Present Occupation_____

Street and No._____

City_____ State_____

Canadians may send this coupon to International Correspondence Schools, Montreal, Canada

Learn to PAINT SIGNS and SHOW CARDS

Get into this interesting, profitable and fascinating business where the field is not crowded. Thousands of cards used weekly. Department stores, clothiers, movie shows, etc., pay big prices—work done quickly and easily—profits large—hundreds of jobs all around you. My students can more than pay for course doing jobs in spare time while studying. Increase your salary, get a better job or go into business for yourself.

Earn $18.00 to $45.00 a Week—Easily

I will train you to fill a big salaried job. I personally correct every lesson. 17 years' successful teaching. Thousands of successful graduates all over the world. No town too small, no job too big for my graduates. Get my training—start now.

Big Money in Card, Sign and Bulletin Business

No other profession pays such profits—work comes to you in abundance—no job will stump you—my students learn all. All the newest, swellest designs, how to run the business, how to hire men, how to keep records, in fact gives you a complete training. You can finish my course in a short time. Read my guarantee—don't be out of a job or work at low wages any longer—

Get Started Now.

FREE Outfit Write now for special literature and prices on 5 courses—terms, testimonials, sample lesson and Free Outfit offer. **All Free**—Don't delay, act quickly.

Guarantee I guarantee to place competent graduates at $85.00 to $175.00 monthly. The demand for trained competent men is far greater than the supply.

Detroit School of Lettering, Dept. 626 Detroit, Mich.

BIG PAY

Expert tractor operators can get good positions anywhere. Demand greater than we can supply. One thorough course fits you in 3 to 4 weeks to take position. Write today for facts.

CLEVELAND AUTO SCHOOL
1814 E. 24th Street, Cleveland, Ohio

AT HOME Learn to SING

Send 2-cent stamp for helpful Booklet P, "The Voice Made Beautiful."

HARVEY SUTHERLAND Educational Building, 70 Fifth Ave., New York, N. Y.

Easiest Shorthand

Learn in 5 evenings home study; then acquire speed with K. I. Shorthand. **Amazingly simple,** easy. Approved by experts. Write dictation, messages, etc., **rapidly as spoken,** after brief, pleasant practice. Favorite method for personal use; make notes at lectures, meetings; keep confidential **diary.** Big help in any profession or business; aid in your career. Used in Army, Navy, courts, commercial schools; by public and private stenographers, teachers. Slight cost. **K. I. Shorthand**—for busy people, including YOU. **Proof Lessons,** Refund Guarantee and Brochure with Testimonials free, postpaid. Address:

KING INSTITUTE, EG-187, Station F, NEW YORK CITY

A GOOD POSITION

with **UNCLE SAM** is most desirable. Life positions, pleasant surroundings, good pay, steady work, short hours, promotions on merit. Both sexes. No political pull. Thousands of appointments yearly. Most thorough preparation $5. Returned if not appointed. Full information and questions used by the Civil Service Commission free.

AMERICAN CIVIL SERVICE SCHOOL WASHINGTON, D. C.

LEARN PIANO TUNING AT HOME by the aid of the TUNE-A-PHONE. Earn $5 to $15 per day. Valuable book Free. Write **NILES BRYANT SCHOOL OF PIANO TUNING, 23 Music Hall, Battle Creek, Mich.**

A Bigger Job Yours—If You Master

Traffic Management

Reconstruction work to be done in Europe and expansion of our foreign trade means a greater demand than ever before for men trained as traffic experts. Great plants working overtime—raw materials shipped in—finished products shipped out—carloads, trainloads, shiploads, going North, East, South, West—contracts placed not on price basis, but for quick delivery—that is the condition we are facing.

"We must have efficient traffic men" say manufacturers, jobbers, railroads, shipowners. Hundreds are needed where one is available. This is the chance for ambitious men to rise to higher positions—to get into an uncrowded calling—to have the specialized knowledge which commands big salaries.

Train by Mail Under LaSalle Experts

This opportunity is yours now. Train while you hold your present job. Only your spare time required to become proficient in every branch of traffic.

Learn from men who have held or are among those now holding the highest positions in the field. Get practical training—the training which equips you to step into one of the highest places. This is what the LaSalle experts offer you.

They will explain every point concerning Freight Rates Classifications, Tariffs, Bills of Lading, Routing, Claims, Demurrage, Express Rates, Ocean Traffic, R. R. Organization, Regulation and Management, Laws of Carriers, Interstate Commerce Rulings, etc. etc.

How many men are expert on even one of these subjects? You will be made proficient in all.

And here is something more—your enrollment gives you free the privileges of our Business Consulting Service. This means advice from our staff whenever you need help on any special business problem.

Over 800 people here—300 business experts among them—are ready to put you on the road that leads directly to advancement. Get the complete, combined experience of many authorities, all given in easily understood form.

No Large Fees

The total cost is small. Your increase in earnings will soon pay it (see in next column what McMullen, Wright and other members say). Then also you can pay on easy terms—a little each month if you wish. No hardship in getting this training. Any man can afford it. And the time is now—when the great movement in business is beginning. Give a few hours weekly of your spare time for a few months—and get a larger salary.

Send the Coupon and Get All the Facts

Your request will bring complete information. We will tell you just what the course offers in every detail; all about the opportunities open to trained traffic men. We will also send you our book, "Ten Years Promotion in One" which has shown thousands of men the short road to promotion. If you are ambitious to rise—if you want to enter a paying and uncrowded field of business, get these facts. Sending the coupon implies no obligation upon you. Mail it today.

B. S. McMullen was a freight checker on the docks at Seattle.

Two years after beginning the LaSalle Course in Interstate Commerce and Traffic Management he was appointed General Freight and Passenger Agent.

He said that it would probably have taken him 8 or 10 years to make this advance if he had depended merely upon work and experience.

LaSalle experts helped him to reach the top in the space of months.

T. J. Wright, an Illinois member, reports three promotions since taking the course.

H. S. Watson, of Michigan, figures his increased earning capacity at 400 per cent.

Fred Hoffman, an Ohio member, reports 500 per cent profit on his investment in one year.

Among the many LaSalle trained men who are now Traffic Managers or Experts on Interstate Commerce are:

Wm. Ritchie, Vice-President and Traffic Manager, Philadelphia Lawn Mower Co.

F. E. Combs, Traffic Director, Twin City Traffic League, Benton Harbor, Michigan.

F. E. Hamilton, Traffic Manager, Retail Merchants Association of Canada.

Mr. Hamilton says: "I cannot speak too highly of this institution. The course is up-to-date, authentic, and easily understood. My only regret is that I did not take it up five years ago."

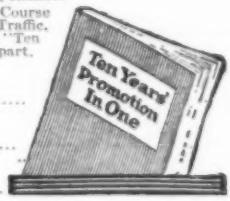
The success these men have made can be paralleled by any other ambitious man who will do as they did—train!

LASALLE EXTENSION UNIVERSITY

"The World's Greatest Extension University"

Dept. 664-IC **Chicago, Illinois**

Please send me your catalog and full information on your Course and Consulting Service in Interstate Commerce and Railway Traffic. Also a copy of your valuable book for the ambitious man, "Ten Years' Promotion In One." This without obligation on my part.



Name .....

Address .....

Present Position .....

You Can Do It

In Your Spare Time

We Guarantee You SUCCESS

SUCCESS means bettering your position, pay and prospects. Getting on, getting promotion, means knowing a little more than the other fellow. Being able to think and act for yourself—having a grip on your task—that's the stuff that doubles and trebles your pay. You can do this—do it without a doubt—and we'll guarantee it. No matter what line you follow, we can give you the right grip on your job—the grip that boosts your earning power. We've put thousands in better positions, and we can put YOU.

Don't Pass Up Promotion

Settle the question now: Do you want to get ahead? You do. Then give us the privilege of pushing you ahead. Our guarantee below insures satisfaction. It is your guarantee of success. You can't lose a cent—except by refusing to look this fact in the face: YOU CAN ONLY SUCCEED BY TRAINING.

Read This Guarantee Then Act!

"We guarantee at any time during the first year of your enrollment to refund the entire amount paid if immediately upon the completion of ten examinations you notify the School that you are not satisfied with your Course."

AMERICAN SCHOOL of Correspondence
Dept. G.A.74
CHICAGO

TRAINING—THE KEY TO SUCCESS

Please send me booklet and tell me how I can fit myself for the position marked X

ASC

.....Western Union Courses	.....Steam Engineer
.....Telephone Engineer	.....Lawyer
.....Draftsman and Designer	.....Business Manager
.....Automobile Engineer	.....Cert. Public Accountant
.....Automobile Repairman	.....Accountant and Auditor
.....Airplane Mechanic	.....Bookkeeper
.....High School Graduate	.....Stenographer
.....Fire Insurance Expert	.....Gen'l Education Course
.....Sanitary Engineer	.....Com. School Branches
.....Heating and Ventilating Engineer	.....Electrical Engineer
.....Master Plumber	.....Electric Light and Power Superintendent
.....Civil Engineer	.....Hydroelectric Engine
.....Structural Engineer	.....Wireless Operator
.....Mechanical Engineer	.....Architect
.....Shop Superintendent	.....Building Contractor

Name .....

Address .....

Please Mention Popular Mechanics

DOUBLE YOUR INCOME *by* RENEWING OLD TIRES

IT'S the biggest money maker today. Demand for repaired tires grows constantly. There never was a better time to start in this business. We teach you how to do expert work and show you best way to operate business. Repairmen make $30 to $50 a week; good repair shops make $100 to $500 a week.

WE TRAIN YOU BY MAIL

Our course goes right to your home. It is complete, inexpensive and practical. We guarantee to train you to be an expert tire repairman in three months so that you can repair fabric tires, all makes of cord tires, big pneumatic truck tires, and tubes. Course has endorsement of large tire factories. We show you how and where to get the best equipment for doing the work. Write today for free information and outline of our course.

Hovey Extension School of Tire Repairing
312 Second National Building AKRON, OHIO

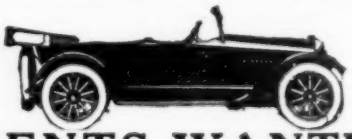
Learn Photography

Good-paying positions in the best studios of the country await men and women who prepare themselves now. For 25 years we have successfully taught

Photography, Photo-Engraving and Three-Color Work

Our graduates earn $25 to $75 a week. We assist them to secure these positions. Now is the time to fit yourself for an advanced position at better pay. Terms easy; living inexpensive. Largest and best school of its kind. Write for catalog *today.*

ILLINOIS COLLEGE OF PHOTOGRAPHY
Box P, 999 Wabash Ave. Effingham, Illinois



AGENTS WANTED!

This Five Passenger 37 H. P. car. 116 in. wheel base. All bearings Timken. Delco Ign.—Dyneto Stg. and Ltg. Write at once for my great Free Offer and 48-page catalog. Agents wanted to drive and demonstrate. Territory open. Prompt shipments. Cars guaranteed or money back. 1919 cars ready.

BUSH MOTOR CO. J. H. BUSH, President. Dept. F-34 Bush Temple, CHICAGO, ILLINOIS

STUDENTS ART MAGAZINE

Publishes cash art assignments, lessons and articles on Cartooning, Designing, Illustrating, Lettering, and Chalk-Talking. Criticises amateurs' work. Full of interesting and helpful information for artists and art students. Satisfactory or money refunded. 10 cents a copy, $1 a year.

Send $1 NOW, stamps or bill.

STUDENTS ART MAGAZINE, Dept. 460, Kalamazoo, Mich.

STAMMERERS

You can be cured quickly, permanently and privately. Write me personally for free booklet, "How to Stop Stammering."
Samuel A. Robbins, Prin. Boston Stammerers' Institute
246 Huntington Ave. Boston, Mass.

LEARN WATCH REPAIRING!

You can learn by our modern and original system of instruction every part of the Watch Repairing Trade at home as good or better than at a shop. You can earn money while learning and secure a well paying position or start in business after completing our course of instruction. Good watch repairers are always in demand and earn from $[illegible] to $50 per week. For particulars apply to the

WISCONSIN SCHOOL OF WATCH REPAIRING
166 Mason St., MILWAUKEE, WIS.

"if I only knew how to locate the trouble"

That's the problem which puzzles thousands of owners and drivers of automobiles, trucks, and tractors. Every day somebody finds themselves baffled with an apparently new, unheard-of and difficult problem—absolutely powerless without the help of expensive experts.

—and yet!

—almost every question you can possibly ask about automotive engineering will be found answered sanely, sensibly and understandingly in some one of the issues of

American Automobile Digest

The Popular Magazine for Owners, Drivers, Dealers and Garagemen

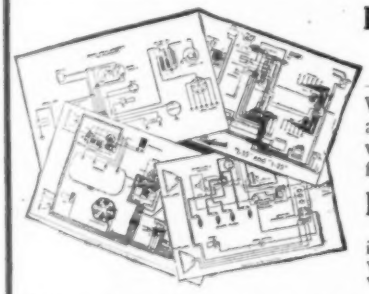
A plain, practical monthly digest of news and information concerning the automobile world. A summary of reliable data on every phase of automobiles, trucks and tractors; written in plain, easily understood language that anyone can quickly grasp and readily apply.

Covers every possible subject in the automobile field—gas engines, pistons, spark plugs, batteries; starting, lighting and ignition systems; combustion, oiling; washing, tire trouble and every other difficulty connected with automobiles.

Any single issue is worth dozens of dollars to the automobile owner—the man who drives his own car. Gives hundreds of ideas for the care of the car.

How to get better gas and tire mileage.
How to keep engine running smoothly.
How to detect and locate trouble.
How to adjust electrical difficulties, etc.

Always brimful of valuable facts from cover to cover. One man said, "The American Automobile Digest is worth $25.00 of any car owner's money and will pay big dividends even at that price."

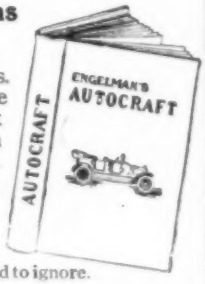


Four Electrical Wiring Diagrams Featured in Every Issue

—a diagram for each of four different cars. With these diagrams you can instantly locate and correct any electrical difficulty. Think what that means! This feature alone is worth five dollars per month to any garage man.

Engelman's Autocraft FREE!

The book that tells HOW. Contains boiled down information on every phase of automobiles. A handy volume that should be in every car. A copy given free with each yearly subscription—a bargain you can't afford to ignore.



Every Car Owner or Driver Should Read American Automobile Digest

Each issue is timely—up to the minute. Tells the things you want to know; answers the questions that puzzle you most. It simplifies the things about automobiles that are mysteries to most of us and tells how to get better service from your car.

Only $1.00 Yearly

Any single issue is worth ten times the subscription price. Get a copy NOW! Go to nearest newsstand and buy this month's issue, or, fill out this coupon, enclose with a dollar bill, your check or money order for one dollar, and the book and magazine will come promptly. Examine them carefully. If they are not all we claim, return the book and we'll refund your money without question.

REFERENCE: ANY BANK IN CINCINNATI

AMERICAN AUTOMOBILE DIGEST 86 Butler Bldg. CINCINNATI, O.

SIGN AND MAIL COUPON TODAY

American Automobile Digest
86 Butler Bldg., Cincinnati, Ohio

Gentlemen: If your magazine offer is as good as you claim, I want it. Enclosed is one dollar for one year's subscription. It is understood that if first copy and Autocraft Book are not satisfactory, I have privilege of returning book and getting refund of my money.

Name.....

Street.....

City.....State.....

☐ Old subscription ☐ New subscription

You Can Do It

In Your Spare Time

The Dollar Value of High School Training

HAVE you ever thought *why* so many employers demand a High School training of their employees—why the lack of it bars you from the best positions? Take English and Mathematics, for example. What high-grade position—such as accounting, engineering or executive work—can be handled *rightly* without a knowledge of mathematics? How can costs, operating expenses and overhead be accurately computed without it? How can you write good business letters and reports or sell goods without a command of English? There is a positive cash value to having a High School training. It means many more dollars to you, because it throws open to you high-grade positions from which you are now barred.

Don't Be Handicapped

Thousands like YOU—who were laboring under the handicap of not having had a High School training—have taken advantage of the American School course and REMOVED THEIR HANDICAPS. This course has been specially prepared for home study by noted professors. It is complete, covers all requirements, and will remove the biggest obstacle between you and success.

If you have already had some part of a High School Training, you can start in exactly where you left off. We'll credit you with what you have taken and make the tuition fee in proportion with the special course you require.

Read this Guarantee—then Act

"We guarantee at any time during the first year of your enrollment to refund the entire amount paid if, immediately upon the completion of ten examinations, you notify the School that you are not satisfied with your course."

AMERICAN SCHOOL of Correspondence
Dept. A. H. 74
CHICAGO

TRAINING—THE KEY TO SUCCESS

Please send me booklet and tell me how I can fit myself for the position marked X

ASC

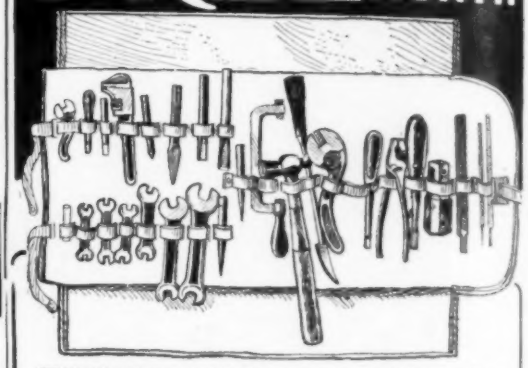
.....High School Graduate
.....Western Union Courses
.....Telephone Engineer
.....Draftsman and Designer
.....Automobile Engineer
.....Automobile Repairman
.....Airplane Mechanic
.....Fire Insurance Expert
.....Sanitary Engineer
.....Heating and Ventilating Engineer
.....Master Plumber
.....Civil Engineer
.....Structural Engineer
.....Mechanical Engineer
.....Shop Superintendent
.....Steam Engineer
.....Lawyer
.....Business Manager
.....Cert. Public Accountant
.....Accountant and Auditor
.....Bookkeeper
.....Stenographer
.....Gen'l Education Course
.....Com. School Branches
.....Electrical Engineer
.....Electric Light and Power Superintendent
.....Hydroelectric Engine
.....Wireless Operator
.....Architect
.....Building Contractor

Name .....

Address .....

Please Mention Popular Mechanics

These Tools FREE THIS MONTH



EVERYONE who enrolls this month with The Milwaukee Motor School will receive a fine New Kit of Tools without any charge whatsoever. There are no strings tied to this offer. This set of 29 Tools and Bag worth fully $15.00 are yours to take home with you. You know about the great success of The Milwaukee Motor School—last month you saw our large double page ad.

Here you receive the most practical training it is possible for you to get—Everything pertaining to Auto, Truck and Tractor Motors. Repairing, Adjusting, Overhauling, Magnetos, Carburetors, Starting and Lighting, Ignition, etc.—The unusually thorough teaching at this school is well known. You do the actual work yourself.

NOW IS THE TIME TO ENROLL. Even if you can't start this month, get your enrollment in now on this Free Offer. Write me for full particulars TODAY—NOW.

WM. H. ARNELGER, Pres.

Milwaukee Motor School Dept. JPH 555 Downer St. MILWAUKEE, WIS.

WANTED IN AVIATION

Thousands of Airplane Mechanics, builders, assemblers, riggers, inspectors, etc., in the service and factories. We train you in an actual Airplane factory, in 6 to 8 weeks. Our graduates make good with a bang. Write at once for special offer.

Bud Morriss Airplane School 3511 Lincoln Ave. Dept. 1916, CHICAGO

Prepare Lead in Future Plans For AERIAL TRANSPORTATION

LEARN TO FLY Be An Authority on **Modern Methods**

Our Pilots were licensed instructors in Government Air Service

SCHOOL NOW OPEN. Address:

Service Aviation, Training and Transportation Co., Wabash, Ind. U. S. A.

Agents for Canadian J N's. Prices on new and used Ships on Request.

HOME STUDY

(28th Year)

Courses in English, Spanish, Mathematics, Chemistry, Drawing, Economics, Education, and in 35 other subjects are given by correspondence. Begin any time. *Address*

The University of Chicago
Division 4 Chicago, Ill.

Improve Your Memory

IN ONE EVENING

Thousands have done it through the Roth Memory Course in seven easy lessons. Be able to remember names, faces, numbers, rates, appointments, speeches, etc., on the instant. Examine the course free for five days, then decide. Price $5 if you keep it. Otherwise no obligation. Write today to Independent Corporation, Dept. R-456, 119 West 40th St., New York City

Learn WIRELESS N-O-W

Enter the Field of Greatest Opportunity

NOW that peace is here wireless offers the greatest opportunity of the day to the young men of America. The experimental stage has passed. Wireless now equals in importance telegraphy and telephony, and if the present commercial wireless program is carried out, it may supplant them by the end of 1919. It has earned its place among the great commercial industries of the earth. So great has been the development and growth of Wireless in recent years that there is now a tremendous shortage of operators.

Peace Increases Demand for Wireless Operators

Actually thousands upon thousands of Wireless Operators, Inspectors, Mechanics, Electricians, and Radio Draftsmen will be needed for permanent "peace time" wireless positions at bigger salaries than have ever before been paid. Peace means a bigger demand for men in every branch of wireless and is opening up new fields of Commercial Wireless activity which will fairly revolutionize present methods of communication.

No Previous Experience Necessary

You Can Learn Wireless in Ten Weeks in Your Own Home, through our practical home study wireless course. No previous experience or training is necessary in order to become a Successful Wireless Expert. With our help you can quickly qualify for a good position at big pay. Many of our students have secured positions before completing the course. You will make rapid progress from the start because our course is based on actual practice and teaches you what you will need to know to make a big success of Wireless work.

Get Your Instructions from the Nation's Capital

(Our Course is endorsed by U. S. Government Officials)

The National Radio Institute headed by authorities who have been closely allied with government training of students, was established in 1914 and is the first school in America to successfully teach Wireless by Mail. The work is under the direction of J. E. Smith, E. E., director of the Radio Department Howard University, and E. R. Haas, formerly of the Radio Division of Yale University.

We now have students throughout the world. Our location in the Nation's Capital together with the standing of our officers and their wide acquaintance among government officials connected with Wireless activities place us in position to give our students the best instruction obtainable and to be of the utmost help in assisting them to secure good paying positions.

Travel and See the World

If you want to travel and see the world — go to foreign countries, and increase your knowledge of world affairs Wireless offers you the chance of a lifetime. However, you are not obliged to travel, but may secure a permanent position at one of the big Land Stations, Railroad, Telegraph, or Steamship Companies if preferred.

Pay As You Go Along with Your Lessons

Our plans of payment bring a wireless education within the reach of anyone who desires to learn. A small payment down on our convenient payment plan, and small following payments, enables you to earn the cost of your tuition while actually learning to be a wireless operator.

Earn Up to $250.00 per Month

In the short period of ten weeks we can make of you a wireless operator, a man with a profession, independent, and not subject to the rise and fall of wages in the labor market. Salaries are as high as $250.00 per month. We give you this training at home, by mail, in your spare time. It is not necessary for you to lose any time from your work to take the course. Then when you have received your diploma from us we help you find a good position.

Free Instruments to Every Student

In addition to text books, lessons and personal instruction, we send you while taking our course, a Home Practice Set consisting of a standard sending key and buzzer, and a Universal automatic wireless transmitting and receiving set. These instruments are free to every student.

Announcement—Opening of Norfolk School

The demand for our Course has grown to such an extent that we are now preparing to open a school in Norfolk, Va., which will be under the management of Mr. A. H. Van Nostand, Radio Inspector of the Third Radio District.

FREE Our booklet "WIRELESS, the Opportunity of Today," gives you complete information in regard to our course, the quick and easy methods by which you can master wireless, and other important facts you should know. It is free. Just mail the coupon. No obligation whatever on your part.

MAIL THIS COUPON TODAY

National Radio Institute

Department 75, Washington, D. C.

Send me, free of charge, your booklet, "Wireless, the Opportunity of Today," with full particulars regarding your famous 10 weeks Home Study Course, and your Special Free Instrument Offer.

Name.....

Address.....

Town.....

$1000.00 for a Single Drawing

THINK OF IT! Leading illustrators and commercial artists frequently receive this much, and **more**, for single pictures or designs, and their work is eagerly sought.

Everyone may not achieve their remarkable success, yet it is a true index of the splendid opportunities ready and waiting **today.** Thousands of advertisers, periodicals and publishers buy millions of dollars' worth of designs and illustrations every year.

If you like to draw, develop your talent into a high-salaried ability. Learn in your spare time by the "Federal" home-study method—a Course endorsed by artists and illustrators of national repute. **Easy to Learn, Easy to Apply.**

"YOUR FUTURE" FREE. *Every young man and woman should read this beautifully illustrated 50-page book. It's free for the asking*—**send now.**

Federal School of Commercial Designing
641 Warner Building **MINNEAPOLIS, MINN.**

7 2/3¢ A DAY BUYS A GIBSON

Terms as low as $5.00 down and $2.30 per month. Mandolin, Guitar, Tenor Banjo or Guitar Banjo sent on approval. Liberal allowance on old instruments in exchange for the "Gibson." Get our new **Free Book**—112 pages, 111 illustrations. Valuable information for player and teacher. Explains wonderful new violin construction with carved and graduated Top and Back and Stradivarius Arching. Also free treatise on "How to Practice."

Teach and sell the Gibson Make $1800 to $5000 or More a Year

Become a teacher. Splendid opportunities for Mandolin and Guitar teachers—either sex, in every locality, for private and class instruction and sale of "Gibsons." They have "made" many a teacher professionally and financially. We have permanent teaching and business opportunity now open for either sex. Other positions pending. Write promptly. A. C. Brockmeyer, St. Louis, Mo. Teacher and Director, writes, "Will do $10,000 business in 1917; did $7,000 in 1916." **Wm. Place, Jr.,** Providence, R. I., Star Soloist for Victor, **unqualifiedly endorses the "Gibson."**

TENOR BANJOS—Most popular member of banjo family. Powerful, sweet tone, lively—"banjolistic," but musical—obtained by exclusive Gibson features. Great for dance playing or home. Play from any piano score-melody or chords—straight or "jazz."

Do Business on our Capital

Become our agent. We help sell. Agents' territory protected. Stock furnished. **We pay the advertising. You make the profit.** You pay for goods when sold; return goods not sold. Try our **"Still Hunt," FREE** to those interested, our new $1.00 book **"The Organization, Direction and Maintenance of the Mandolin Orchestra,"** by **Wm. Place, Jr.** America's most successful director. Write now for Catalog, Treatise, "How to Practice, Psychologically Explained," all free. Don't wait; **ACT NOW.**

Fill in the coupon.

Gibson Mandolin-Guitar Co.,
Parsons St., Kalamazoo, Mich., U. S. A. Gentlemen:—Without obligation send me **free book** complete Catalog, free treatise, also information about the Wm. Place, Jr., book and instrument **checked.**
If teacher check here ☐
☐ Mandolin ☐ Mando-cello ☐ Guitar
☐ Mandola ☐ Mando-bass ☐ Harp-guitar
☐ Tenor Banjo ☐ Guitar Banjo
Name _____
Address _____
Be sure you have checked instrument.

GIBSON MANDOLIN-GUITAR CO.,
165 Parsons St., Kalamazoo, Mich., U. S. A.

Mining Engineering
For Your Profession

A wide and profitable field, not overcrowded, is open to forward-looking young men. The Michigan College of Mines (established 1886) offers a comprehensive four year course which can be completed in three years. Its breadth provides foundation for expert specialization in that field of engineering which most appeals to the student. All phases of technical knowledge and instruction relative to mine development and operation thoroughly presented by constructive methods. Practical experience is here combined with theoretical work in a rare way. *College is located in center of one of the world's greatest copper mining districts.* Close relations are constantly maintained with mines, mills, smelters, electrolytic and power plants which are practically a part of the College equipment and a factor of enormous value in instruction. "M. C. M. Men Make Good." For descriptive book address Principal, Houghton, Mich.

Michigan COLLEGE OF Mines

EARN $50 TO $100 A WEEK

Writing business getting letters. SYSTEM'S Course in Business Correspondence tells you how. Examine first lesson FREE. See our ad page 15 April Popular Mechanics.
EDUCATIONAL DIVISION, Dept. M5, A. W. Shaw Co., 5 N. Wabash Ave., Chicago

LEARN TYPEWRITING MODERN METHOD

With your two hands and a typewriter you can command success anywhere. Competent typists have good government and civil positions. With a typewriter in your own home, you can write short stories, scenarios, do billing, etc. You can also earn good money in your spare time by copying legal papers, addressing, etc. This modern method enables you to master typewriting at home, in a short time.

By Practicing on a Standard Typewriter.

You can write 80 to 100 words a minute even with your eyes closed. Need not interfere with your present occupation.

We loan you absolutely FREE a standard typewriter on which to practice.

First lesson shows results. *WRITE TODAY.*

PATTEN TYPEWRITER INSTITUTE
53 West 125th St. **New York, N. Y.**

ST-STU-T-T-TERING

and Stammering cured at home. Instructive booklet FREE.
Walter McDonnell, 724 Potomac Bank Bldg., Washington, D. C.

Stop Eating Poison!

Wrong food combinations are poisonous and destroy health—right combinations build health. Eugene Christian's 24 lessons in Correct Eating tell how to eat for health, strength and efficiency. Send for Free Trial. No Money in Advance offer. Write today. **Corrective Eating So.,** Dept. 50, 443 Fourth Ave., New York City

MENSURATION
FOR SHEET METAL WORKERS

Gives practical problems for the tinsmith, cornice and skylight maker, slate and metal roofer.
128 pages. 115 illustrations. Price, $1.00 postpaid.
POPULAR MECHANICS BOOK DEPT., 6 N. Michigan Avenue, Chicago

TELEGRAPHERS MEN AND WOMEN EARN $115 to $400 PER MONTH

and are in GREAT DEMAND! YOU can become EXPERT under OUR "DUNLOP SYSTEM" in TWO to FOUR MONTHS! LAND WIRE OR WIRELESS.

TENTH FLOOR **CHICAGO TELEGRAPH INSTITUTE** **220 S. STATE ST. CHICAGO**
AMERICA'S FINEST SCHOOL

How Fred Cline Got His Start

Began With Almost Nothing — Now Pocketing $6,000 A Year and His Profits Steadily Increasing

New 5c Confection Did It

Says Anyone Anywhere Can Do As Well—No Experience Necessary

A good many men who know Fred Cline would like to be in his shoes. They envy his success. But he hasn't always been envied. Time was when he was barely earning a living

Saving money out of the meagre wages he got in those days was almost impossible. He had practically nothing laid aside. But it was enough to give him his start; enough to set him up in business for himself—a new kind of business that has proved a regular little "gold mine."

That was only a few years ago. Today Fred is making around $6,000 a year—and his profits are steadily increasing. While he doesn't work half as hard as he used to, he is pocketing more every day than he formerly earned in a week. Is his own boss—doesn't have to take orders from anyone. Has bought a fine home—all paid for. Rides around in a $2,000 car. Has a substantial and growing bank account. Enjoys many other comforts and luxuries that a few years ago he scarcely even dreamed of.

How did he do it? No previous business experience—had been a plain workman. Had only a common school education. And he himself would be the last man in the world to credit his quick rise to prosperity to any special genius or ability on his part.

Some may say he was lucky. But it wasn't luck. Proof of that is the fact that hundreds of others, both before and since, have put themselves on Easy Street in exactly the same way he did.

Here is the whole secret. It was a money-coining machine that piled up Fred Cline's profits, that built his house, that paid for his car and other comforts; a patented machine that almost automatically builds up a fine business by making the finest 5c confection that anyone ever ate—a wholesome, delicious and entirely different new kind of pop-corn candy that people grow wild over wherever it is introduced. It is called Crispettes—so tempting to look at, so appetizing in its delightful odor, so bewitching to the taste—that it literally turns into money as fast as it can be made.

Now Owns a Fine Home

Fred Cline deserves full credit for his success. He was quick to see his opportunity and quick to seize it. But when you know the facts, it is easy to see why Fred has prospered. Regardless of age practically everybody has a sweet tooth — men, women, children. Crispettes appeal to this universal sweet tooth in a way that is simply irresistible. You can't see them or smell them or taste them without feeling "hungry" for them. Unlike chocolates and other "heavy" candies, they don't tax the digestion. You can't eat enough Crispettes to hurt you. People never get tired of them. That means steady, come-again customers.

They are only 5c a package — an amount that is easy to spend; where there is one person who can afford high-priced candies, there are hundreds who will buy at 5c. Nickel sales to the many will always beat dollar sales to the few. On a good day Crispettes sell about as fast as you can hand out the packages and take in the money. They almost sell themselves. The mere sight or smell of them makes the mouth water—and makes a person reach for a nickel.

The Crispette Machine can turn out as high as 800 5c packages an hour—$40 every hour. Nearly 4c out of every nickel you take in is clear profit — about 76c out of every dollar. The ingredients are nothing but pop-corn and syrup—but cooked and blended together by a special formula that brings out an enchanting new flavor that people say is the most delicious they ever tasted.

There is only one way to make Crispettes — that is on the patented Crispette Machine. The process is almost automatic. Special secret formula included with the machine. Also full instructions for building up a profitable business right from the first day, either retail or wholesale or both — the tried and proven ideas used by scores of others already in the business. I show you how to draw crowds—how to cash in on fairs, picnics, holidays, etc. — every step made easy so you can't go wrong. No experience necessary. The Crispette Machine, the Crispette formula and the instructions are all you need. Small sum buys the complete outfit. Don't even have to open a store. Can do business from your home or rent part of a store window. The Machine in a window is a great salesman—attracts attention—brings in customers. And there are many other advantages.

No wonder (*) Fred Cline is making money. But he isn't the only one. Crispette Machines and the delicious candy they make are piling up fine profits for hundreds of others. Listen: An inexperienced boy "cashed in" $1435 the first five weeks. A former clerk in a railroad office got his start in the Crispette business and is now wealthy. Another man made $400 net in one week. A former printer sold $22,000 worth of Crispettes the first seven months—figure his profits for yourself.

Bought This Car from Profits

Another man made over $500 in a single day. Another $700 ahead in less than two weeks. And so it goes.

This is a big country. There are still thousands of towns and cities waiting for some live man to start up in the Crispette business. Big money-maker by itself or can be handled in connection with other business. Every town of 1,000 people or more means an opportunity. May be here is exactly the chance you yourself have been wishing for. Why not at least look into it? Just send me your name on the coupon below and I'll send you all the facts and figures so you can judge for yourself — including the names and addresses of all the men mentioned here, with letters from them and others backing up everything I say. But send the coupon **now**—before you have a chance to forget — and before someone else in your town beats you to it. A postage stamp is all it costs to get the facts—that is all you have to risk to find out about a money-making opportunity that may mean prosperity for the rest of your life.

Cash in on Prohibition

Think of the millions of dollars heretofore spent for liquor! After July 1st it will go for other things. The Crispette business will be the first to profit. Towns previously dry show that men who can't get liquor turn to Crispettes by thousands—they crave sweets—and Crispettes make a hit because they can be eaten all day long without hurting anyone. Prohibition also gives children more nickels to spend. Investigate now—don't wait until someone else seizes this opportunity.

(*) This man is modest. Fred Cline is not his real name—he prefers not to have his identity published broadcast in a magazine. His real name and address, however, will be given on request.

Find Out How They Did It — Simply Use This Coupon

W. Z. Long, 1412 High St., Springfield, Ohio

I am interested. Please send me your FREE book on full particulars how to start a big paying business of my own.

NAME.....

ADDRESS.....

Learn Mechanical Dentistry Earn $150 to $300 a Month

BIG DEMAND EVERYWHERE

Mechanical Dentists are in big demand in all parts of the country. Every town has opportunities. Dentists employ Mechanics to do all Plate, Bridge, Crown, and Restoration Work. This profession is intensely interesting and pays big from the first day you start. Dignified work. Short hours. Unlimited opportunities. If you are ambitious and want to earn $150.00 to $300.00 a month without delay, come to this big, practical school and get the necessary training and practice under master instructors.

Learn Here in Shortest Time

This is one of the best equipped Schools of Mechanical Dentistry in America and you can learn here quickly and get most practical instruction. Our graduates are in demand and we are constantly having more calls for competent men than we can fill. EASY TO LEARN. **No previous experience or special education necessary.** You learn by doing—no books used. We supply all tools free. No "extras" to buy.

Free Book Write at once for Free Book, filled with pictures and facts that will open your eyes. Mechanical Dentistry is the one profession open to the average man that **pays big.** Investigate NOW!

Kansas City School of Mechanical Dentistry
220 Admiral B'vd., Kansas City, Mo.

FREE BOOK COUPON

Kansas City School of Mechanical Dentistry
220 Admiral Blvd., Kansas City, Mo.

Send me your Free Book showing opportunities in Mechanical Dentistry and explaining your short time course of instruction.

Name.....

Address.....

.....

DO YOU LIKE TO DRAW

Cartoonists Are Well Paid

We will not give you any grand prize if you answer this ad. Nor will we claim to make you rich in a week. But if you are anxious to develop your talent with a successful cartoonist, so you can make money, send a copy of this picture with 6c in stamps for portfolio of cartoons and sample lesson plate, and let us explain.

THE W. L. EVANS School of Cartooning
821 Leader Bldg., Cleveland, O.

"The Strong Man of the Navy"

"It gives me great pleasure to tell you that I claimed and defended the title which I now hold. I can give credit to no one except you for my physique and strength."

The above quotation from one of our advanced pupil's letters indicates the results we obtain.

IF YOU ARE GOING IN FOR PHYSICAL CULTURE, WHY NOT GO AFTER RESULTS?

Send for Catalog of Adjustable Dumb-bells and Folder 18, describing our TRAINING courses. **Both Free**

Milo Bar-Bell Company
Third & Diamond Sts. Dept. A. Philadelphia, Pa.

$100 FOR ONE DRAWING

Illustrators, Cartoonists, Commercial Artists make big money. You can earn $25 to $100 a week and more. Learn at home in spare time under personal direction of Will H. Chandlee, famous newspaper, magazine, advertising artist of 30 years' successful experience.

Free Coupon

Washington School of Art, Inc.
1096 H Street, N.W., Washington, D. C.

Send me particulars of FREE ARTIST'S OUTFIT Offer and free book, "How to Become an Artist."

Name.....

Address.....

City.....State.....

Be An ARTIST

Delightful, fascinating profession. Wonderful new, home-study method makes drawing easy! Send coupon or postal today for amazing offer—complete Artist's Outfit given

FREE! to new students. Write for handsome book, "How to Become an Artist." Don't delay—write, or send coupon, at once. Address

Washington School of Art, Inc.
1096 H Street, N. W.
Washington, D. C.

WHICH WAY ARE YOU LOOKING?

ARE YOU looking back or forward? Are you looking back into the days of small earnings or ahead into the days when you can earn more? The way your face is turned is the most important thing in your life today. Will your future be an asset or a liability? Will it cost you money or will it make money for you?

Turn these questions over in your mind and face the right way now. Big pay checks go to the men who know—the trained men—the men who make use of what other men have learned. You can get into this big check class too. Right now your opportunity is before you—on this very page.

THE GREAT books described here were written for men who want to earn more by other men who have reached the highest point in their profession. In a short time you can learn from them everything it has taken these experts years and years to learn. These men tell you what they know in the simplest possible way.

Get the benefit of what they have done for you. Send the coupon on the corner of this page **now.**

We will send you any set of books you select for **Free Examination.** See the **No Money** offer below.

Here's All the Help You Need

Carpentry and Contracting

Five volumes, 2138 pages and more than 400 illustrations. Prepares for Contractor, Building Superintendent and Carpenter Foreman. Regular price, $25.00. Special price, $17.80.

Fire Prevention and Insurance

Four volumes, 1500 pages and 600 illustrations, diagrams, forms, etc. Prepares for Counterman, Rate Clerk, Inspector or Agent. Regular price, $20.00. Special price, $15.80.

Automobile Engineering

Five volumes, 2400 pages and 2000 illustrations. Prepares for Garage Foreman, Automobile Mechanic or Chauffeur. Invaluable to car owners. Regular price, $25.00. Special price, $17.80.

Steam and Gas Engineering

Seven volumes, 3300 pages and 2500 illustrations, plates, diagrams, etc. Prepares for Stationary, Marine or Locomotive Engineer or Fireman. Regular price, $35.00. Special price, $21.80.

Civil Engineering

Nine volumes, 3900 pages and 3000 illustrations, plates and diagrams. Prepares for Civil or Structural Engineer, Transitman, Estimator, Designer or Chief Draftsman. Regular price, $45.00. Special price, $29.80.

Electrical Engineering

Seven volumes, 3000 pages and 2600 illustrations, plates and diagrams. Prepares for Electrical Engineer, Power Plant Superintendent, Substation Operator or Electrician. Regular price, $35.00. Special price, $19.80.

Machine Shop Practice

Six volumes, 2300 pages and 2500 illustrations. Prepares for Machine Shop Superintendent or Foreman, Foundryman, Pattern Maker, Tool Designer or Tool Maker. Regular price, $30.00. Special price, $19.80.

Law and Practice

(with Reading Course in 25 bound pamphlets). Thirteen volumes, 6000 pages and 24 illustrations. Prepares for all Bar Examinations. A wonderful aid to business men. Regular price, $72.00. Special price, $39.80.

Telephony and Telegraphy

Four volumes, 1728 pages and 2000 illustrations, plates and diagrams. Prepares for Telephone Engineer, Wire Chief, Exchange Manager, Trouble Man or Telegrapher. Regular price, $20.00. Special price, $12.80.

Accountancy and Business Management

Ten volumes, 3680 pages and 1987 illustrations, forms, etc. Prepares for Certified Public Accountant, Auditor, Office Manager, Accountant, Credit Man or Bookkeeper. Regular price, $50.00. Special price, $24.80.

Sanitary, Heating and Ventilating Engin'ring

Four volumes, 1454 pages and more than 1400 illustrations, etc. Prepares for Sanitary Engineer, Heating and Ventilating Engineer, Master Plumber or Plumber. Regular price, $20.00. Special price, $13.80.

Practical Accounting

Four volumes, 1840 pages and 800 illustrations, plates and diagrams. C. P. A. questions and practical problems. Prepares for Accountant, Bookkeeper or Cost Clerk. Regular price, $20.00. Special price, $12.80.

DON'T SEND MONEY

The coupon filled out is all you need. Tell us what books you would like to examine and we will send them to you at once by express collect. You won't be under any obligations to buy and you don't have to send one penny. Take a whole week to decide whether or not you would like to own them and ship them back at our expense if you don't think they will help you earn more. If you do want to keep the books just send us $2.00. The balance of the special reduced price can be sent the same way—$2.00 each month.

FREE SERVICE With these books goes free a year's consulting service in the American Technical Society, worth $12.00. This enables you to consult our engineers and experts for one year without charge.

American Technical Society, Dept. X-119-A, Chicago

American Technical Society, Dept. X-119-A, Chicago, Ill.

Please send me set of.....
for **7 days'** examination, shipping charges collect. I will examine the books thoroughly and, if satisfied, will send $2 within 7 days and $2 each month until I have paid the special price of..... If I decide not to keep the books, I will return them by express at your expense. Title not to pass to me until the set is fully paid for.

Name .....

Address .....

Reference .....

OFFICIAL TESTS GIVE BRUNSWICK TIRES FIRST PLACE

Here Is The Evidence:

DEC. 15, 1918.

Mr. T. A. Dwyer, Treas.,
The Brunswick-Balke-Collender Co.,
35 West 32nd St.,
New York City.

My dear Mr. Dwyer:

1. No doubt you will be somewhat surprised to hear that I have received my discharge and expect to be back in New York in the near future.

2. The following information will probably be of interest to you.

3. While I was serving as expert for the Government on the Motor Transport Board in Washington, D.C., I had charge of the examination and tests of all the different pneumatic tires of "Standard Makes" at Camp Hallbrad, Md. Altogether there were three tests:

1. Road Test 2. Chemical Test 3. Overseas Test

4. The Road Test was very severe, being over some of the worst roads in Maryland with an exceptionally heavy load of merchandise. This test proved that your pneumatic tire had gone ten thousand miles before hitting the fabric.

5. The Chemical Test was scientific, the tire being put into a tank of very strong acids and salts and kept therein for forty-eight hours. This test also proved your tire superior to all others. After the Chemical Test it was put through what is known as the Fire Test. This simply means that the tire is put into an oven and baked and the results showed that your rubber was properly cured.

6. The Overseas Test is the most interesting and severest of them all. The tire is put on a spin-wheel with an inner tube with a hundred pound air pressure and spun around on a sort of a Cam Shaft at a terrific rate of speed, hitting all kinds of broken metal and glass, tacks and nails, and in fact several sorts of sharp edges that would penetrate through the rubber and fabric. It affords me great pleasure to inform you that the Brunswick Tire came out away ahead for endurance and service of all the other tires, which were up for examination before the board, of which I was chairman.

7. All the above experiments required a new pneumatic tire of each make for each test, and the tires were bought at different points throughout the United States, so that the manufacturers would not get special made tires to put over on us.

With best regards to Mr. C. P. Miller and yourself and wishing you a prosperous New Year, I am

Sincerely Yours,

Chairman Examining Board,
Motor Transport Corp.,
Washington, D.C.

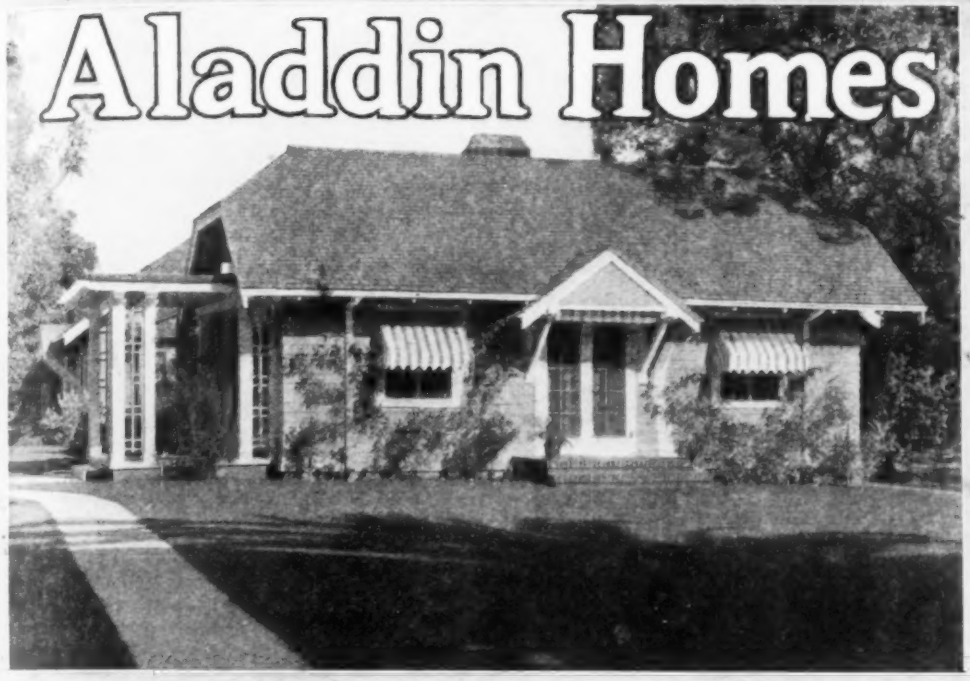
BRUNSWICK TIRES and TUBES

There's a Brunswick Tire for Every Car—Cord, Fabric, Solid Truck. We Offer to Dealers a Unique Opportunity. Write for Proposition.

The Brunswick-Balke-Collender Company, General Offices: **623-633 S. Wabash Avenue, Chicago**

Branches in the Principal Cities of United States and Canada

Aladdin Homes



Build Your Home This Year!

That charming bungalow Home — bordered in flowers — bathed in sun-light — the one you have dreamed of — can now be yours. It may be a snug and cozy cottage, complete with five rooms on one floor, or a more pretentious bungalow of charming proportions. These types and many others are found in the Aladdin Book — complete home-building library of 100 designs — 100 ideal homes. Besides this, there is a vital message for you in this most remarkable book, that will be sent at your request.

$18 Out of $100 Saved

Of course, you would like to save money building your new home—would like to build at the lowest possible price. But you cannot expect to save very much money by bargaining or getting different prices. You can only expect to save money by saving labor in building your home and eliminating waste of lumber. Aladdin Readi-Cut Houses are cut-to-fit in Aladdin Mills by Rapid Power Machines. Old-fashioned building waste is reduced from 18% to less than 2% —a saving of practically $18 on every $100 worth of lumber. And you save a third of the labor in builidng your home. This saving of lumber and labor will mean a large percentage of the cost of the entire building. The Aladdin Book shows you how it is done. **Send for this book today.**

Send for Beautiful Book of Homes

Aladdin houses are cut-to-fit—no waste of lumber or labor. The Aladdin price includes all materials cut-to-fit as follows: Lumber, millwork, flooring, outside and inside finish, doors, windows, shingles, lath and plaster, hardware, locks, nails paint, varnishes.

ALADDIN READY-CUT HOUSES — Sold By The GOLDEN RULE

Send today for copy of "Aladdin Homes" No. 180

THE ALADDIN CO., 965 Aladdin Ave., BAY CITY, MICH.

Canadian Address: Canadian Aladdin Co., Ltd., C. P. R. Bldg., Toronto, Ont

Stick

Cream

Powder

Liquid

Makes Hard-water Shaving Easy

Half of the men of the United States have to shave with "hard" water. And the Williams' chemists took careful note of that fact when they created their shaving soap.

Even the "hardest" water can't make Williams' lather sticky or stringy. Wherever you travel, whatever water you get, the Williams' lather is always abundant, creamy, velvety, and will not dry on your face. Globe-trotters, traveling salesmen, sailors and soldiers, know this. They know, too, that the patented holder-top adds great convenience in using the stick—a convenience which grows greater the longer you use it. Get a stick tonight and defy the hardest water and the hardest conditions.

Send 20c. in stamps for trial sizes of the four forms shown here. Then decide which you prefer. Or send 6c. in stamps for any one.

The J. B. WILLIAMS CO.
***Dept. A*, Glastonbury, Conn.**

After the shave or the bath, you will enjoy the comforting touch of Williams' Talc Powder. Send 4c. for a trial size of the perfume you prefer—Violet, Carnation, English Lilac or Rose.

Williams'

PATENTED Holder Top Shaving Stick

THE J.B WILLIAMS COMPANY, GLASTONBURY, CONN.

Push! And the Spring Pushes It Back

The long, live spring in the "YANKEE" Quick Return Spiral Ratchet Screw-driver relieves you of much of the work of driving and drawing screws. Saves about half your time too.

Just PUSH on the handle—and the spring pushes it back, ready for you to push again. You need not pull nor twist. Just PUSH! The spring holds the blade snugly in the screw-slot.

To draw the screw, just move the Ratchet Shifter and—Push! The Spiral Ratchet works just as well in reverse.

And speed? Fast as you can move your hand. You can't outspeed the Return Spring.

Best of all, you can work one-handed; 'way up over your head and in awkward places where you can't use both hands.

Right- and left-hand Ratchet and rigid adjustment, at the touch of your finger to the shifter.

And don't think that "YANKEE" Tools are delicate or fragile because they are not heavy and awkward. Every "YANKEE" Tool will not only do the work for which it is intended, but has rugged strength that will withstand actual abuse.

"YANKEE"

Quick Return Spiral Ratchet Screw-Driver

With three sizes of bits.

No. 130—Standard Size (illustrated)	Price **$2.70**
No. 131—Heavy Pattern	Price **$3.50**
No. 135—Light Pattern	Price **$2.15**

Your Dealer Can Supply You

The "YANKEE" Quick Return Spiral Ratchet Screw-driver makes a practical and powerful Push Drill, too. You can obtain the following "YANKEE" attachments: Chuck and Eight Drill-points; Screw-holder; Screw-eye holder; Countersink.

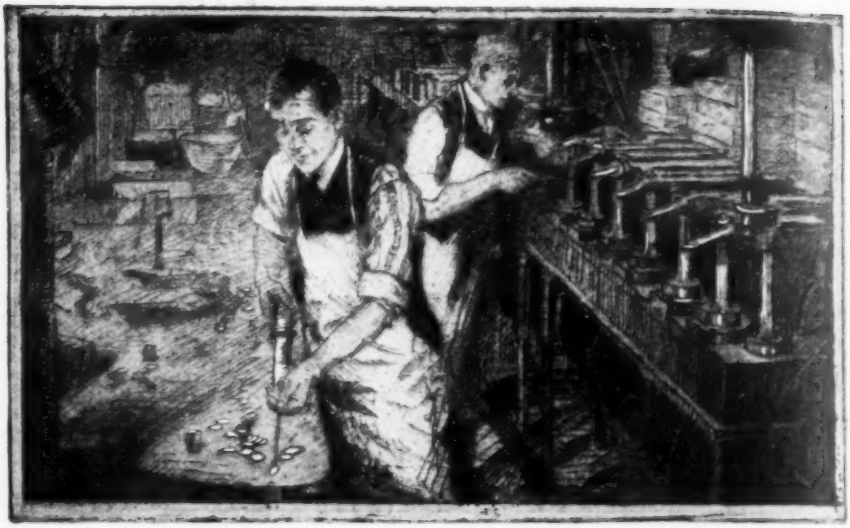
Write for this free "YANKEE" Tool Book showing "YANKEE" Tools in action; better ways of drilling, boring, tapping, and driving and drawing screws.

NORTH BROS. MFG. CO.
PHILADELPHIA

"YANKEE" TOOLS

Make Better Mechanics

WALTHAM THE SCIENTIFICALLY BUILT WATCH



AND THE FOREIGN BUILT WATCH

Know Something About the "Works" in the Watch You Buy

IF you open your watch and examine its mechanism, you will find it consists substantially of two supporting plates, between which is mounted a gearing of meshed wheels to take care of the movement, recording time. This is called the train, which we will speak of in our next advertisement.

The lower supporting plate in a Waltham watch is the foundation upon which every unit revolves and is fixed. It is bored with minute holes to take the pivots, screws, pinions, etc.

This lower plate is drilled and threaded by one of the most exclusive and wonderful machines ever designed by the genius of man — an exclusive Waltham invention from the master-mind of Duane H. Church.

Many operations are accomplished with such methodical, automatic regularity that one instinctively imagines that a marvelous human brain guides the extraordinary operations of this machine.

It makes every operation (and there are 141) with infinitesimal exactness to the ten thousandth part of an inch — flawless, beautiful in its complex simplicity — every plate a replica of every other plate, proving Waltham standardization to be one of the miracles of American mechanical genius.

The plate of the foreign built watch is subject to the variations of hand process. Made to variant sizes and models without precise relation to the parts which they are to contain, which parts are made elsewhere in many homes and small shops, by hand.

No hand work could ever approximate the beautiful and flawless exactitude of this Waltham drilling and threading.

So when you buy a Waltham watch you are assured of a standardization of quality and leadership which has placed the Waltham watch on the pedestal of world dominion.

Pendant and Bow Patented

Waltham Colonial A
Extremely thin at no sacrifice of accuracy
Maximus movement 21 jewels
Riverside movement 19 jewels
$135 to $255 or more
depending upon the case

WALTHAM

THE WORLD'S WATCH OVER TIME

Please Mention Popular Mechanics

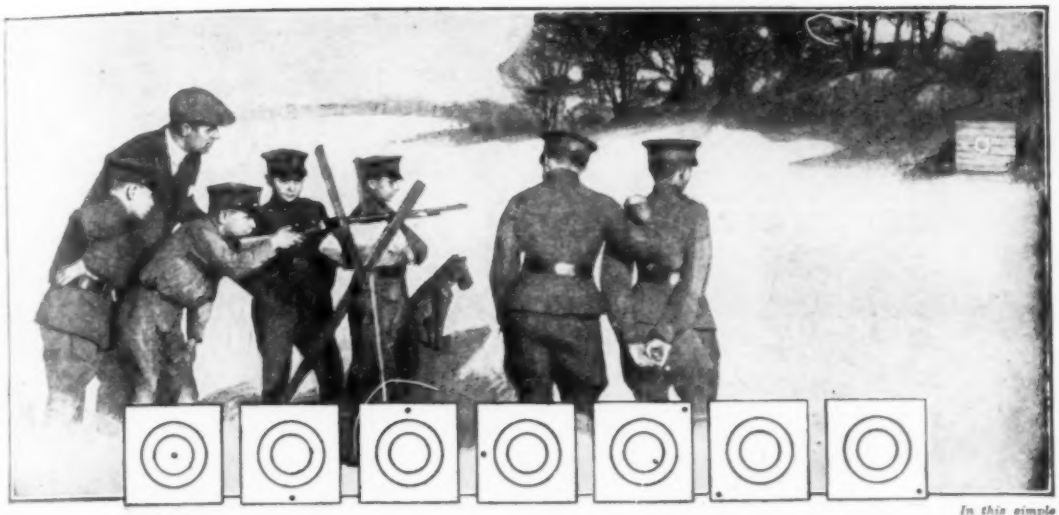


Fig. 1 Full open sight. Correct aim. — *Fig. 2* Fine sight. Low shot — *Fig. 3* Too full. High shot — *Fig. 4* Not centered. Left shot — *Fig. 5* Not centered; too full. High right shot — *Fig. 6* Sight inclined. Low left shot — *Fig. 7* Sight inclined. Low right shot

In this simple sighting stand, the rifle is pillowed on a bag of loose earth. When the boy thinks he has lined up the sights on the target, the rifle will hold its position while the instructor sights along the barrel to see if the aim is correct.

How to draw a bead on a mark

Sharpshooter Medal

IF you don't know the best way to sight a gun and plug the target square in the bull's-eye, it will pay you to study the diagrams on this page. These diagrams are taken from the book of instructions furnished to members of the Winchester Junior Rifle Corps.

Instructions in alignment of sights, the three correct positions for shooting, rules for gun safety, are given to every member of the Winchester Junior Rifle Corps. Every fine point that makes for expert shooting is taught in this organization of expert boy Marksmen of America.

Start a W. J. R. C. "Unit" with your friends

Why not get together with half a dozen of your chums, join the Winchester Junior Rifle Corps and organize a regular Unit, which will be officially recognized by National Headquarters?

The W. J. R. C. will help you from start to finish in rigging up an indoor or outdoor range. It provides for officers, supervisors, and adult instructors to make your shooting safe. It costs you nothing to join the W. J. R. C. There are no dues and no military obligations. The W. J. R. C. was organized solely to encourage better marksmanship and better sportsmanship among boys and girls of America. Any boy or girl not over 18, who is in good standing in his or her community, is eligible.

Membership in the W. J. R. C. covers the United States. There is hardly a town now that has not at least a small "Unit" of the big National Organization where boys are learning to become expert riflemen and are competing among themselves for the famous Winchester Marksman, Sharpshooter and Expert Rifleman Medals.

Get the official plan and handbook

Write today for the Winchester Junior Rifle Corps "Plan for Organizing a W. J. R. C. Unit," and for the official handbook, "How to handle a rifle safely." This booklet tells you all about the W. J. R. C. and describes in detail the fine points of shooting.

If you are a boy scout, give your name in full, the troop you belong to and the name of the Scout master.

If you are not a boy scout, state what boy organization, if any, you belong to, giving the name of the official in charge.

National Headquarters
WINCHESTER JUNIOR RIFLE CORPS
275 Winchester Avenue
New Haven, Conn., U. S. A.
Division 630

Standard types of .22 caliber Winchester Rifles, popular with members of the Winchester Junior Rifle Corps

WINCHESTER *MODEL 06. Take-down Repeating .22 caliber rifle, 20-inch round barrel. Shoots three sizes of ammunition. The most popular .22 caliber repeater, used extensively by members of the W. J. R. C.*

WINCHESTER *Take-down .22 caliber single shot rifle. A low priced, light-weight gun made in two sizes.*

WINCHESTER JUNIOR RIFLE CORPS

National Headquarters, 275 Winchester Ave., New Haven, Conn., U. S. A.
Division 630

Winchester Junior Rifle Corps
Nat'l Headquarters, 275 Winchester Ave., New Haven, Conn., U. S. A. Division 630

Gentlemen:

Please register my name as a member of the Winchester Junior Rifle Corps, and send me a membership button and certificate of membership. Also tell me how to organize a Local Unit of the W. J. R. C.

Very truly yours,

Name.....

Street Address.....

City..... *State*.....

Temperature is a mighty force in your life

HEALTH—food—clothing—everything you use in daily life—practically everything you do—is dependent or influenced by temperature.

There's a safe temperature for the home and office, just as there is for baby's bath.

There's a temperature of the human body which indicates health. Another—sickness.

The most digestible, palatable foods are those prepared according to specific temperatures—not guesswork.

Human energy at home, in the office, in the shop, is influenced by temperature tremendously.

You want to know what the temperature of the room is, how cold it is outside, and whether the sick one has fever.

But to KNOW, to be able to control heat and cold conditions, you must have accurate and reliable aids. Guesswork won't do, it's dangerous.

In the manufacture of instruments ranging from the delicate fever thermometer to the Fery Pyrometer registering accurately into thousands of degrees, Tycos makers stand alone.

Tycos Temperature Instruments

For nearly 70 years we have been making recording, indicating and controlling instruments to fit every temperature need and purpose. We catalogue over 8,000 types and styles—conclusive proof of the variety of conditions temperature effects.

Every instrument that leaves our laboratories is all that science, skill, organization, experience, system, rigid inspection and infinite pains can make it.

Tycos Thermometers help you control it

527

Here are some of the many requirements of which you perhaps may not be aware:

That in the distillation of any liquid a thermometer is important.

That vulcanizing is vitally dependent on control of temperature.

That the temperature of developing and toning baths in photography is highly important.

That the TYCOS Fire Alarm Thermometer when installed in connection with bells and batteries is proving an efficient fire alarm. (Used by U. S. Navy on battleships).

What is your particular temperature problem?

Thermometers

Armored
Art Novelty
Asphalt Testing
Auto-Circulation
Babies' Food
Bakers'
Bake Oven
Bank
Bath
Bottle Testing
Brine Pipe
Brooder
Butter
Cabinet
Calorimeter
Candy Making
Cellar
Celluloid
Chandelier
Chemical
Churn
Clinical
Coal Oil
Cold Storage
Cold Test
Copper Cased
Dairy
Decorative
Dental
Desk
Developing Bath
Dial
Display
Distillers'
Dough Testing
Dry Kiln
Electric
Electric Alarm
Engraved System
Fat Testing
Fever
Frost Alarm
Fruit Car
Fruit Evaporating
Gas Works
Glass Angle
Glass Window
Greenhouse
Ham Boiling
Home Candy Making
Hop Curing
Hot Bed
Hot Water Heating
Household
Hydrometer Can
Laboratory
Lithographed Tin Scale
Mantel
Maple Sugar
Marine
Mash Tub
Mash Pipe
Maximum
Maximum and Minimum
Meat Packers'
Meat Testing
Milk Pasteurizing
Milk Sterilizing
Minimum
Orchard
Oven
Packing House
Paper Weight
Pasteurizer
Photographers'
Pipe
Plate Glass
Pocket
Porcelain
Precision
Railway
Railway Coach
Radial Scale,
Recording
Registering
Refrigeration
Sea Water
Ship Hold
Shower Bath
Show
Sick Room
Six's Registering
Sterilizing
Sugar House
Sugar Factory
Test
Titer Test
Tobacco Curing
Toning Bath
Track Laying
Traveling
Veterinary
Vulcanizing
Weather Bureau
Window
Wood

Other Instruments

Aviation Aneroids
Barometers
Calciometers
Chargometers
Clinometers
Compasses
Cream Gauges
Freezometers
Hydrometers
Hygrometers
Hygro Autometers
Psychrometers
Rail Gauges
Recording Baro-Thermograph
Saccharometers
Salinometers
Sphygmomanometers
Sprayometers
Stormagraphs
Thermographs
Transits

Mark the instruments above that interest you. Write your name and address on the page, send us the page. If instrument in which you are interested is not listed write us. Interesting descriptive literature will be sent you immediately.

Taylor Instrument Companies

Rochester, New York

There's a *Tycos* and *Taylor* Thermometer for every purpose

Please Mention Popular Mechanics

Getting Soldiers back into overalls

As the generous and energetic co-operation of America's industries helped her to share in allied victory, so should those same industries now face a second patriotic duty.

When victory came, the INDIAN organization saw that second duty; helping America's fighters reap the benefits of their wartime training.

Almost simultaneously with the signing of the armistice, the INDIAN Soldiers' Service Department began its successful work of bringing together employers in the industry and those efficient and reliable motorcycle men now returning from service.

America's industries helped to mobilize America's forces—they may now be depended on to lighten the Government's task of demobilization.

Hendee Manufacturing Company
SPRINGFIELD, MASS.
The Largest Motorcycle Manufacturer in the World

Indian Motocycle

For Sale by Dealers Everywhere

MADE FOR THE
B.V.D.
BEST RETAIL TRADE
(Trade Mark Reg. U.S. Pat. Off. and Foreign Countries)

If it hasn't this Red Woven Label

It isn't B.V.D. Underwear

A lot of comfort is worth a little insistence
Therefore-Insist upon getting B.V.D.

B.V.D. quality can only be obtained in B.V.D Underwear

THE B.V.D. COMPANY
New York

B.V.D. Coat Cut Undershirts and Knee Length Drawers, $1.00 the Garment.

B.V.D. Sleeveless Closed Crotch Union Suits, (Pat. U. S. A.) $1.75 the Suit.

Copyright U.S.A. 1917 by The B.V.D. Company

Remember, all Athletic Underwear is not B.V.D.

Copyright U.S.A. 1917 by The B.V.D. Company

Dayton Bicycles

Young and old—everybody must "play" a part of the time!

After work, on Sundays and holidays! That's the time for "play"! And nothing can add as much to these short hours as a Dayton Bicycle!

It will take you to the baseball diamond, the tennis court, golf links, fishing hole, and swimming hole quick as a wink. It gives you more time for "play"—and in itself is pleasure and recreation!

Let a Dayton Bicycle help you "play". You'll be proud of it in any company—for it is certainly good-looking!

All Dayton nickel-plating goes on over a heavy coat of copper.

The enameled surfaces, as you see them, represent, in all, some 17 processes—beginning with a bath in boiling lye and ending with the coat of varnish which completes the job.

Between these two operations are the anti-rust and filler coats, the rubbings, washing and bakings—and two coats of the famous Dayton Carmine! The Dayton finish retains its lustre and brilliance. It wears, and wears and wears.

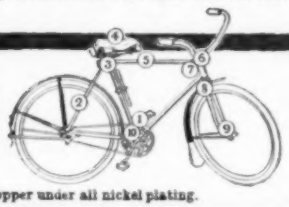
See the Dayton Line at your dealer's. Study the mechanical superiorities pointed out below. Our catalog describes and pictures the Dayton Line completely. It is free.

THE DAVIS SEWING MACHINE CO. DAVIS MADE DAYTON, OHIO.

We Back This Trade-Mark With Our Reputation

Write today for Catalog B-10

Cycle Dept., THE DAVIS SEWING MACHINE COMPANY, *Dayton, O.*



1 One-piece drop-forged cranks. Hobbed sprockets.
2 Special design rear fork, giving extra clearance between wheel and fork sides. Flush rear fork ends.
3 Drop forged seat-post cluster, giving extra strong grip on seat-post.
4 High-grade padded leather saddle with double-action springs. Leather tool bag and complete tool equipment.
5 Seventeen-process enamel finish of Dayton Carmine. Tough and long wearing. Heavy coat of copper under all nickel plating.
6 Dust-proof head adjusting cone. Extra large High-Duty ball bearings. Cones case-hardened in cyanide.
7 Outside joint head construction. Eleven inner reinforcements in frame, all dip-brazed.
8 Double-anchored fork sides with solid steel spool between plates.
9 Front hub and cups of special design turned from solid steel bar. Two-point frictionless bearings.
10 Seamless crank hanger bracket, extra reinforced.

Put an End to Your Spark Plug Troubles

Install a Complete Set of AC Carbon Proof Spark Plugs and See How They Improve the Performance of Your Car

Here is the spark plug you have been looking for—the AC Carbon Proof, for tractors, Fords, Overlands and Studebakers.

Put a set of these plugs in your motor and save gasoline, better its performance, get more power.

For AC Carbon Proof Plugs are spark plugs with the trouble removed.

They do not short circuit easily. They always deliver a big, hot spark. They are well insulated with finest porcelain that heat will not crack, that vibration will not break.

These plugs permit a full advance of the spark without that old, familiar engine knock. After you have installed them you notice immediate improvement in your car's performance. For you get higher engine speed with a smaller throttle opening than before.

That means a big saving in your gasoline bill.

More power, no carbon, better performance, gasoline saved.

Those are the advantages that AC Carbon Proof Plugs bring to you and they cost no more than the ordinary kind.

AC Carbon Proof Plugs are especially designed for tractors, Ford, Overland and Studebaker cars.

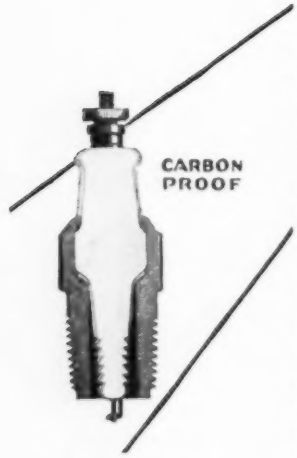
But no matter what car you drive there is an AC designed for it.

As you know well, most makers of fine cars use AC Spark Plugs for standard factory equipment.

Ar. Government engineers during the war selected AC Spark Plugs of the same basic design as the plugs that these manufacturers have been using for years, as standard equipment on all Liberty and Hispano-Suiza Airplane Motors.

The spark plugs which served best in such emergency can be counted upon to serve you best also.

Write for The Spark Plug Story. It contains information of much value to you.

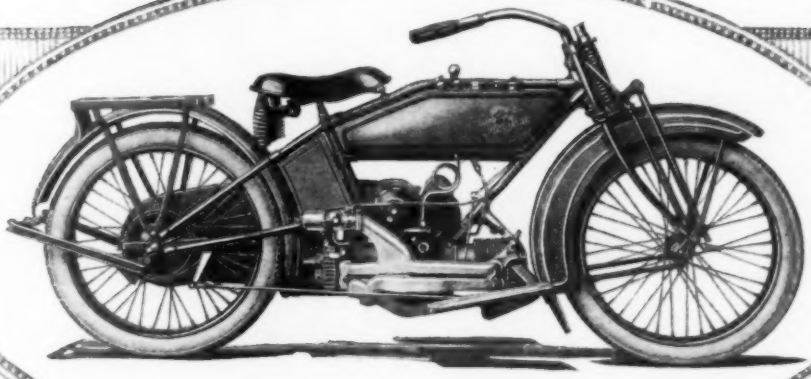


Notice the sharp knife-edged porcelain in the cross section of the AC Carbon Proof Plug here illustrated. That construction is the whole secret of this plug's success. These edges, being thin, heat rapidly. The heat burns off the carbon as fast as it forms. This is an exclusive AC design and fully covered by our patents.

Champion Ignition Company, FLINT, *Michigan*

U. S. Pat. No. 1,135,727, April 13, 1915, U. S. Pat No. 1,216,139, Feb. 13, 1917, Other Patents Pending.

Please Mention Popular Mechanics



The New Harley-Davidson Sport Model

A Horizontal Twin Harley-Davidson Lighter Weight Motorcycle

A powerful, swift, quiet, vibrationless, solo mount—with the sweetest running, cleanest engine **ever** built into a motorcycle.

A Few of Its Features

Unit power plant with horizontal opposed cylinders.

100 pounds lighter than the average twin.

Super-heated, twin-cast manifold.

Drive chain enclosed.

Trussed cushion fork.

Automatic lubrication of motor, transmission and clutch.

Multiple disc steel plate clutch running in oil.

3-speed sliding gear transmission.

Spiral gear system of under-gearing.

That's what those who have ridden it say. You, too, will experience a new thrill and delight when you try it. You will marvel at its ease of handling and splendid riding balance, due to low center of gravity and low saddle position.

Its smooth, glide-away action, its get-away, its pep on the hills—all are due to its perfectly balanced opposed twin motor.

We know you will say it is the greatest achievement in motorcycle engineering.

Go to the nearest Harley-Davidson dealer and ask for a demonstration. Then, and then only, will you know what the Harley-Davidson Sport Model really is.

Harley-Davidson Motor Co.
Milwaukee, Wis.

For Comfort—Wear an "Old Faithful"

There's a world of good solid comfort for the man who wears an "OLD FAITHFUL" shirt while at work. It is built so large throughout, yet fits so well, that you always feel at ease. "OLD FAITHFUL" is good-looking, too, and will outwear three ordinary shirts.

"OLD FAITHFUL" is triple-stitched on every strain seam and reinforced over the shoulder—has two extra wide, deep pockets with buttoned down flaps and you may choose from a variety of standard fabrics which include blue and grey chambray and black sateen.

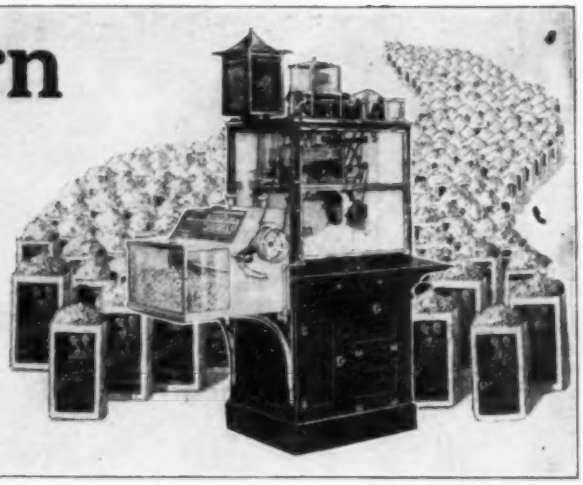
RELIANCE WORK SHIRTS

Go to your dealer today and order one of these famous shirts. It will give you that feeling of satisfaction that comes only from buying a standard article of known value.

Other familiar Reliance brands are the "Milton F. Goodman," "Black Beauty," "Army" and "Honor Bright" for boys. All of these good work shirts are sold by the best dealers.

RELIANCE MANUFACTURING COMPANY
WESTERN MADE WORK SHIRTS
CHICAGO

Stores Earn $600 to $3120 Yearly From a Little Waste Space



Took in $10,000

"Have had our machine over 3 years and have taken in more than $10,000 on pop corn and peanuts."—Bloomington, Ill., population 26,850.

Bought Him a Car

"Profits derived from Butter-Kist machine first 12 months paid for machine and bought me a $1,200 automobile besides."—Electra, Tex., population 640.

Paid For Itself

"Paid for machine out of profits in less than year."—Mt. Pleasant, Ia., population 3,874.

Increased Other Sales 97%

"Made 49,015 sales of Butter-Kist pop corn and peanuts first year and it increased my sale of magazines 97 per cent."—Evansville, Ind., population 76,078.

The Greatest Payer That a Store or Theatre Can Have

Do you realize that America is on the threshold of her greatest business era? Every day we are getting letters from Druggists, Confectioners, Grocers, Bakers, Department and Variety Stores and Film Exhibitors who want the Butter-Kist Pop Corn Machine to attract and expand the enormous retail trade set loose by the ending of war.

What are you doing to seize this life-time opportunity? Will you start right now by sending for our much discussed Butter-Kist book and see the sales records and photographic proof of the hundreds of stores and theaters earning from $60 to $250 clear profit per month, AND MORE, from a little waste floor space 26 by 32 inches?

Pays 4 Ways— *Look!*

1—Motion makes people stop and look.
2—Coaxing fragrance makes them buy.
3—Toasty flavor brings trade for blocks.
4—Stimulates all store sales or theatre attendance.

BUTTER-KIST Pop Corn Machine

Pay From Your Profits

Our Easy Payment Plan gives every buyer a chance to pay right out of his Butter-Kist sales as thousands have done.

Don't think you have to be located in a busy center to make this machine pay. The beauty of the Butter-Kist is the way it draws trade to you. Many a business that never succeeded without this machine has been put on its feet.

An average of only 85 nickel bags a day means $1,000 a year profit.

Everybody loves pop corn and Butter-Kist ranks in highest favor because of Butter-Kist's exclusive toasty flavor, made under our patent process.

Valuable

This coupon has started many a business man on the road to new profits.

Each read an advertisement like this and had the good horse-sense to know that it doesn't cost anything but a postage stamp to investigate.

If this machine pays big profits in towns of 300 and 400 population as well as in the largest cities, then no man in business can afford to ignore it. Mail the coupon now for full facts and amazing success records.

HOLCOMB & HOKE MFG. CO.

204 Van Buren Street — Indianapolis, Indiana

394

For PROOFS, PHOTOS and PRICES

HOLCOMB & HOKE MFG. CO.,
204 Van Buren St., Indianapolis, Ind.

Without obligation, send me your free Butter-Kist book—"America's New Industry"—with photos, sales records, and estimate of how much I can make with your machine.

Name .....

Business .....

Address .....

Ride a Motorcycle

United States Cycle Tires are Good Tires

WHICH is the better way to get home from work—to pack into a crowded trolley car, or to get out into the clean, open air?

Only one answer to that, isn't there?

Boys and men who use motorcycles for business always know the advantage of good tires. They want United States Tires because they are always dependable. No unnecessary time is lost in repairs. They wear longer and are more economical.

United States Tires are made by the world's largest rubber manufacturer and every tire carries the U. S. Seal which means quality in rubber goods wherever you see it.

The 'Usco' Motorcycle Tire is the tire to use for long mileage and hard work. Ask to see it at any United States dealer's.

UNITED STATES RUBBER COMPANY
US
RUBBER SYSTEM
AND ASSOCIATED COMPANIES

Please Mention Popular Mechanics

The STANDARD by which the world judges the quality and efficiency of a fountain pen
"Makes its Mark Around the World"
Waterman's Ideal Fountain Pen
3 TYPES
Regular
Safety
Self-Filling
$2.50 and up
At Best Dealers
Its readiness to write anywhere at any time without dependence upon desk or inkwell gives Waterman's Ideal Fountain Pen users a freedom of action, which enables them to do more and better work, suiting their own convenience as to time and place.
There is a nib to suit each and every individual character of hand writing—A size of barrel to fit any hand, and a type that meets perfectly any specific pen requirement.
A VACATION NECESSITY
Unties you from a desk and inkwell and puts handwriting on the list of out door sports
WATERMAN'S IDEAL FOUNTAIN PEN
CLIP-CAP
L. E. Waterman Company
191 Broadway
New York
CHICAGO BOSTON SAN FRANCISCO

GRAFLEX

The camera that does the difficult things in photography—and does them well.

It's raining as the ship you have come to welcome home is warping into the dock; the automobile racers are going by your point of vantage at a hundred miles an hour; a quick snap of the ball from pitcher's box to "first" has caught the runner napping; the children are romping at play on the half-shaded porch—impossible pictures for most cameras, but simple with a Graflex.

The Graflex catalogue—free at your dealer's or by mail—tells you why.

FOLMER & SCHWING DEPARTMENT

EASTMAN KODAK CO. ROCHESTER, N. Y.

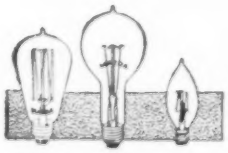
Please Mention Popular Mechanics

MAZDA

"Not the name of a thing, but the mark of a service"

MAZDA is the trademark of a world-wide service to certain lamp manufacturers. Its purpose is to collect and select scientific and practical information concerning progress and developments in the art of incandescent lamp manufacturing and to distribute this information to the companies entitled to receive this service.

MAZDA Service is centered in the Research Laboratories of the General Electric Company at Schenectady, New York. The mark MAZDA can appear only on lamps which meet the standards of MAZDA service. It is thus an assurance of quality. This trademark is the property of the General Electric Company.



A MAZDA Lamp for every purpose

4646

RESEARCH LABORATORIES OF GENERAL ELECTRIC COMPANY

Who's There?

Late in the evening. The bell rings. Perhaps it's a telegram or special-delivery letter from her husband, who is away. Maybe it is a tramp. What will she do? If she has an Iver Johnson she goes to the door with perfect confidence. She has none of the fears and misgivings that she used to have before an Iver Johnson became her protector.

IVER JOHNSON SAFETY AUTOMATIC REVOLVERS

are welcomed in thousands of homes where firearms of any kind have never been before, because they are absolutely safe. The most timid women handle the Iver Johnson without fear or nervousness because *they know* it cannot go off unless they pull the trigger all the way back. You could "Hammer the Hammer" of an Iver Johnson and it would not fire. Its safety is automatic; there are no levers to adjust or forget.

The Iver Johnson Revolver shown in this advertisement has the "Perfect" Rubber Grip. Other models have Regular or Western Walnut Grips. They are on sale at all hardware and sporting-goods stores.

IVER JOHNSON'S ARMS & CYCLE WORKS
307 River Street, Fitchburg, Massachusetts
99 Chambers St., New York, 717 Market St., San Francisco

"HAMMER THE HAMMER"

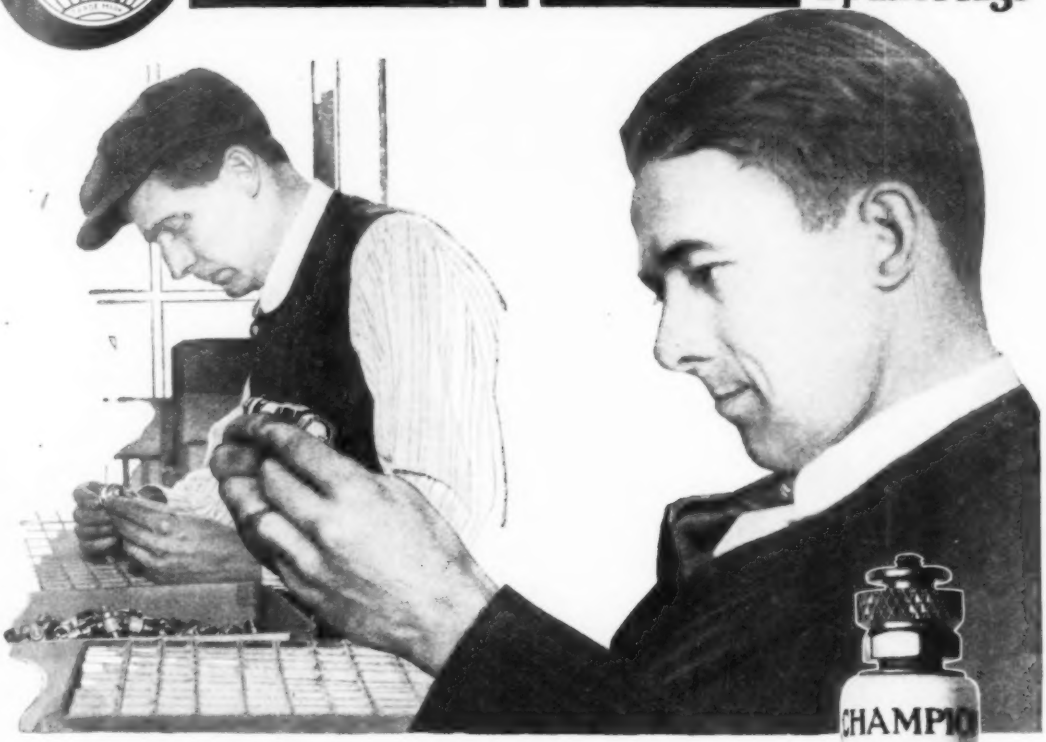
Three Booklets Free

We have three booklets which are well worth reading by anyone interested in firearms, bicycles or motorcycles. Indicate which of these books you want: A—"Firearms," B—"Bicycles," C—Motorcycles."

Why not buy an Iver Johnson this Spring? Have fun, gain health, save money. Iver Johnson Superior Roadster, $50. Other Models, $27.50 to $60.

Please Mention Popular Mechanics

Champion Dependable Spark Plugs



Rigid Inspection Insures Dependability

AFTER Champion Spark Plugs have successfully gone through all the severe tests, such as the "Air Test" and the "Shock Test" that show them to be 100% leak-proof and 100% in durability — Then comes the rigid final inspection!

Long trained experts go over the plugs to make sure that every detail is right, and that there are no imperfections.

The skill and pains taken in this final inspection are characteristic of the care and thoroughness with which Champion Spark Plugs are made and tested.

This care and thoroughness coupled with our famous No. 3450 Champion Insulator and our patented asbestos gasket construction, are responsible for the better performance of Champion spark plugs as compared to other plugs, and their greater resisting power to temperature changes and to shock and vibration.

An increasing number of car owners continue to learn the wisdom of insisting upon the spark plug with the name "Champion" on the Insulator and the world trade-mark on the box. This is *your* safe way to avoid substitutes.

Champion X
For Ford Cars
A15, Price 90c

Champion Spark Plug Company, Toledo, Ohio
Champion Spark Plug Company, of Canada, Limited, Windsor, Ontario

Starrett Tools

SINCE 1880—

For two generations we have been making fine precision instruments—building them to the Starrett standard—not to a price.

Today the name Starrett is recognized the world over as standard for accuracy. Starrett Tools are helping skilled mechanics produce high-quality work.

Write for Catalog No. 21P.

The L. S. Starrett Company

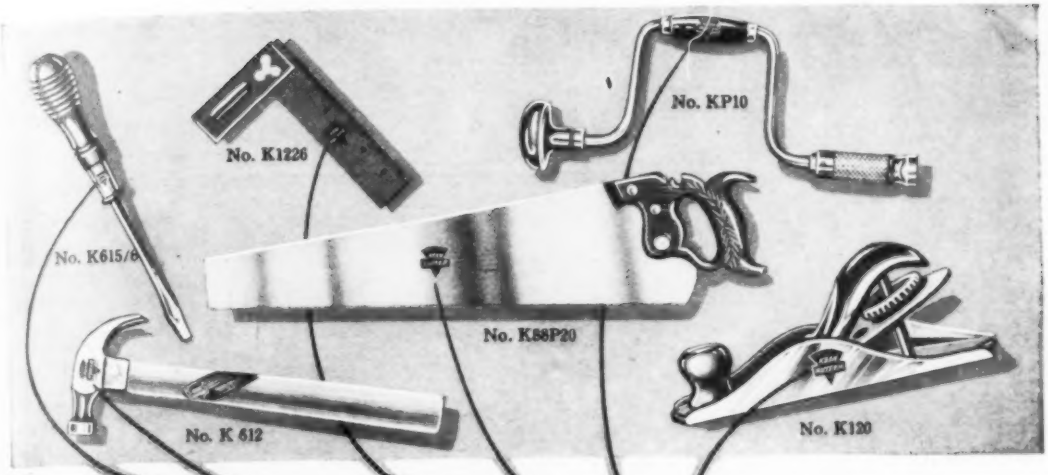
The World's Greatest Toolmakers

Manufacturers of Hack Saws Unexcelled

ATHOL, MASS.

STARRETT TOOLS

48-001



The way to know Quality in tools

You may not be thoroughly versed in the quality of steels or know how to select good tools as the mechanic selects them.

But if you will look for the KEEN KUTTER trade-mark on any tool you buy and insist on getting KEEN KUTTER you can be absolutely sure that the tool you get will be of the highest quality. Correct in design; efficient in use; durable as modern tool makers know how to make them.

KEEN KUTTER tools have been the choice of exacting professional builders and mechanics for years. They will be your choice, once you have tried "KEEN KUTTER" and realize their real superiority.

So look for the KEEN KUTTER trade-mark. It's easy to remember and well worth remembering.

KEEN KUTTER tools are on sale at leading hardware stores, everywhere.

E. C. SIMMONS
KEEN KUTTER
CUTLERY AND TOOLS

"The recollection of QUALITY remains long after the PRICE is forgotten."

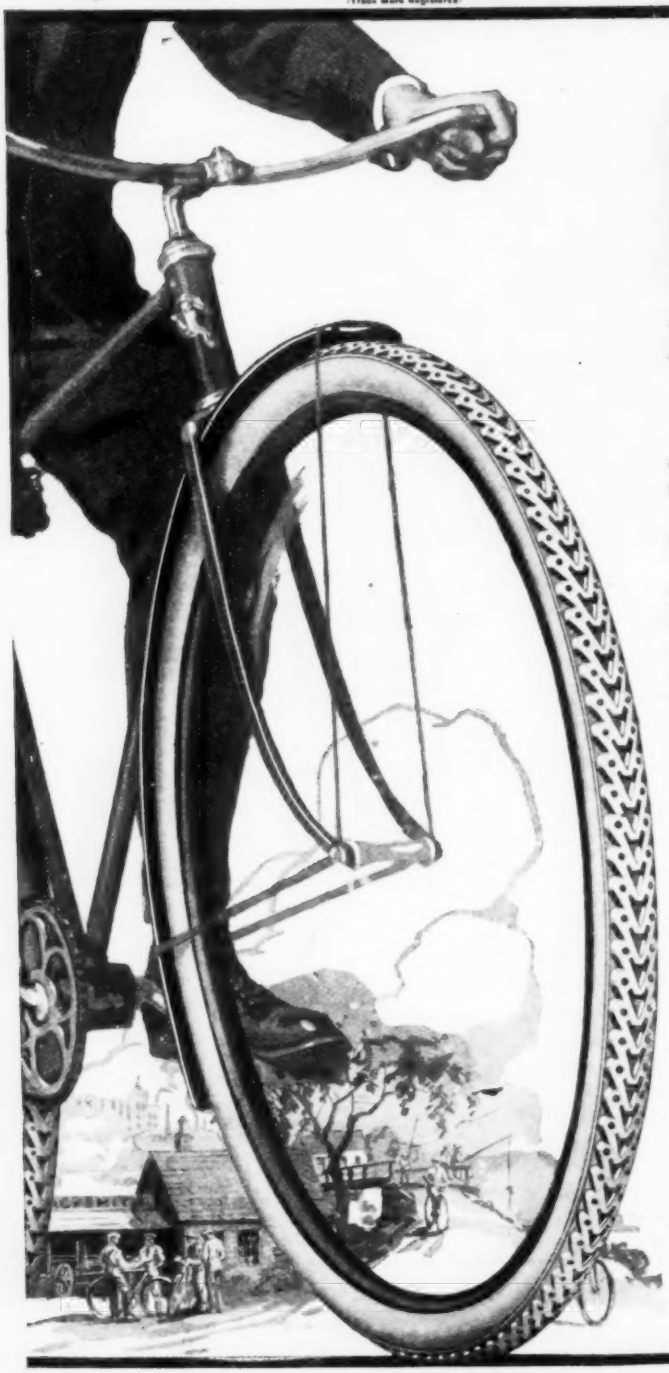
—E. C. SIMMONS.

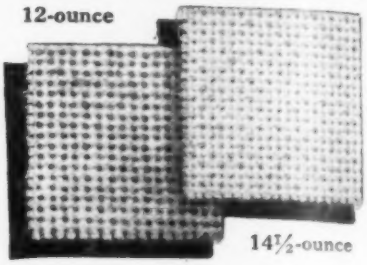
Trade Mark Registered.

SIMMONS HARDWARE COMPANY

VITALIC Bicycle Tires

(Trade Mark Registered)





More Miles for Less Money

What do you buy when you pay out your good money for a bicycle tire?

Rubber? Fabric? Fancy tread? Color? Looks?

Not on your tintype — not if you're wise.

What you really buy and pay for is *miles*—steady, comfortable, easy-riding, puncture-free, real road mileage. And by the same token the economy or extravagance of a bicycle tire is measured by miles and nothing else.

We could make, and you can buy, bicycle tires costing half as much as Vitalics—and they will give you just about a quarter of Vitalic mileage. We think it bad business to make that kind of tires. Do you think it good business to buy them?

Some Inside Information

All Vitalic Tires are made with an extra strong 14½-ounce fabric. The strongest fabric used in any other bicycle tire is 12-ounce — and most bicycle tire fabrics are even lighter. Here is a magnified cross-section of 14½-ounce Vitalic fabric compared with an equally magnified cross-section of 12-ounce fabric.

TRADE MARK

"Tougher Than Elephant Hide"

CONTINENTAL RUBBER WORKS
ERIE, PA.

ACT QUICK

Special Low Prices

SAVE MONEY

STANDARD UNDERWOODS

1 NEW ENAMEL Frame restriped, relettered and newly enameled

2 NEW NICKEL PLATE All type, type bars, etc., renickeled

3 NEW TYPE All necessary new type—perfect print and alignment

4 NEW RUBBER FEET New thumb knobs, new key rings, new rubber feet

5 BACK SPACER We equip our machines with back spacers

Actual Photograph of My Rebuilt Underwoods

Rebuilt and Guaranteed for 5 Years

6 NEW PLATEN Equipped with new platen—new feed roller—new ribbon

7 NEW SCALE FRONT with many other features assures brand new typewriter service

8 TWO-COLOR RIBBON ATTACHMENT rebuilt in our typewriters—every machine perfect

9 NEW KEYS make our rebuilt typewriters look like new

10 NEW LETTERING and you can't tell the rebuilt from a new typewriter

Study These 10 Important Rebuilt Features

They Double the Life of My Underwood Typewriters

All New Parts Where the Wear Comes — Every Machine Tested and Shipped Perfect

These 10 big, important, rebuilt features make it possible for you to buy a just-like-new standard, visible writing Underwood at special low prices. Act quick—investigate and learn how you can get 100% typewriter efficiency at a big discount. My (rebuilt) standard Underwoods are factory reconstructed by typewriter experts. New parts, new finish, new lettering, replace the old; everything made perfect—and the result—a typewriter the equal of any new machine in both service and appearance, just like the actual photograph shown above. And you may buy or rent my (rebuilt) Underwoods on ten days free trial backed by a five year guarantee. Just mail the coupon for all the facts.

I will Rent or Sell You My Standard Rebuilt Like New Underwoods with a 5 Year Guarantee

I offer liberal discounts on your old machines or rebuild them like new at money saving prices.

Besides the 10 features explained above I include many other improvements, such as a two-color ribbon, back spacer, stencil device, automatic ribbon reverse, tabulator, etc., and in addition I furnish free a waterproof cover and a special Touch Typewriter Instruction Book — all for my low price. It's a bargain and I want every typewriter buyer to know the facts. That's why I say — use my (rebuilt) Underwoods before you pay and prove it to yourself. Then after you buy, I guarantee every machine for Five Years. Buy or EARN AN UNDERWOOD FREE. Take advantage of my agency plan. Send coupon or write at once for Offer No. 52.

Buy My Factory Rebuilt Underwoods. Choose Your Own Terms After 10 Days Free Trial; Pay When You're Fully Satisfied

Prove to yourself at my risk that my (rebuilt) genuine standard Underwoods look, work and write like new. You don't even have to buy the machine, when you get it — try one of my Underwoods for 10 days free. It's the first step to cut your typewriter costs. Rent one at low monthly rates, then if you decide, after six months to buy, I'll allow you six months' rent and deduct it from my low price—or BUY it for cash, or get one on easy payments. But do so at once—ask for full facts now. Learn how I save you big money—mail the coupon today.

How I have Rebuilt and Sold 200,000 Perfect Typewriters at Factory Prices

The U. S. Government has purchased over 100,000 Standard Underwoods. The result is that Underwoods are scarce, but you can still buy my (rebuilt) Standard Underwood Typewriters guaranteed good as new. I sell only standard Underwood machines, purchased direct from the Underwood factory. They are then rebuilt in my factory (the largest of its kind in the world) with new parts, obtained direct from the Underwood Company. Send for prices.

You May RENT APPLYING RENT ON PURCHASE PRICE **OR BUY** FOR CASH OR ON EASY PAYMENTS

Send Coupon at Once and Save Big Money. Get the Facts NOW

25 years experience in rebuilding typewriters has taught me how to make my (rebuilt like new) Underwoods stand any mechanical typewriter test. Buy, rent or earn one of my Underwoods—10 days FREE trial. Save big money—investigate this offer. Write a letter, mail a postal or send this coupon — BUT ACT QUICK, if you want one. Get busy now.

E. W. S. SHIPMAN,
President

10 DAYS FREE TRIAL

Mail Coupon TODAY

E. W. S. SHIPMAN. Pres.
TYPEWRITER EMPORIUM,
34-36 W. Lake St., Chicago

Send me at once your Low Price Offer, rental and agency plan No. 52.

Name .....

St. or R.F.D. No. .....

City .....

State .....

TYPEWRITER EMPORIUM

Established Over a Quarter of a Century

34-36 W. Lake St., Chicago

Remember I Back My Underwoods With My FIVE YEAR GUARANTEE

DU PONT AMERICAN INDUSTRIES

Save Laundry Bills

For Men in Every Walk of Life

Here's the collar that saves time and money—won't wilt and always looks neat.

Challenge Cleanable Collars

give you all the style, snap and comfort of Cotton Collars with the added advantage of being instantly cleaned when soiled. 35c each at your dealer's or direct — state your size and style.

Booklet on request.

THE ARLINGTON WORKS

owned and operated by E. I. du Pont de Nemours & Co.

725 Broadway, NEW YORK

DU PONT

Your Investment Opportunities

under the

Reconstruction Period

The foundations of many future fortunes are being laid through the judicious purchase of dependable securities at prevailing low prices. Every indication points to higher levels for meritorious stocks and bonds.

A twenty page publication issued fortnightly citing unusual opportunities in the stock market, free upon request. Write for 4-PM including our copyrighted booklet describing "The Twenty Payment Plan," the original easy-payment method of acquiring good values.

SLATTERY & Co (Inc.)

Investment Securities

40 Exchange Place, NEW YORK

BIG CUT

In Engine Prices

Not a cut in quality—but a definite money-saving reduction — All sizes — Gasoline, Kerosene, Portable Engines and Saw-Rigs, 2 to 30 H-P. I can sell for less because I make nothing but engines, buy materials for cash, and sell engines direct to users.

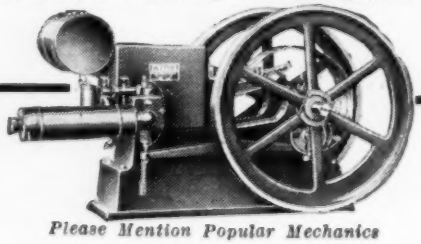
IMMEDIATE SHIPMENT

Let me send you my big new catalog and new reduced price list of kerosene and gasoline engines, FREE, postpaid—then you can judge for yourself. Buy NOW on practically your own terms—get your engine at once and save money. 33 years at it proves WITTE quality. My prices prove the saving. Write me today — **Get my offer.**

ED. H. WITTE, Pres.

WITTE ENGINE WORKS

1741 Oakland Avenue Kansas City, Mo.
1741 Empire Building Pittsburgh, Pa.



Please Mention Popular Mechanics

JOHNS-MANVILLE

Asbestos

JOHNS MANVILLE SERVICE COVERS THE CONTINENT

ENTER A BUSINESS

of your own and earn big annual income in professional fees, making and fitting a foot specialty to measure, readily learned by anyone at home in a few weeks; easy terms for training, openings everywhere with all the trade you can attend to. No capital required or goods to buy, no agency or soliciting. *Address*

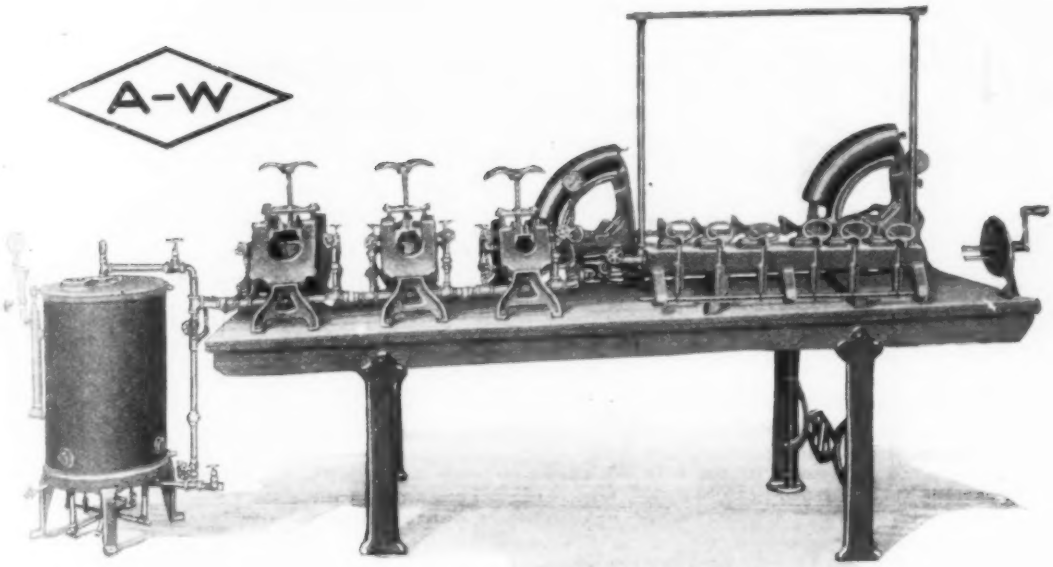
STEPHENSON LABORATORY, 1 Back Bay, Boston, Mass

Mr. Edison's Wonderful New Amberola

Only $100 and After Trial

Keep the New Edison Amberola — Edison's great phonograph with the diamond stylus—and your choice of records, for only $1.00. Pay balance at rate of only a few cents a day. Free trial in your own home before you decide to buy. Nothing down. **Write for our New Edison Book** and pictures, free.

F. K. BABSON, Edison Phonograph Dists., A119 Edison Block, **Chicago, Ill.**



Get This Outfit

It Pays for Itself—Builds a Big, Profitable Tire Repair Business

If you're in the tire repair business or thinking of going into it, the Akron-Williams consulting engineers have a message for you. Write them today and get the complete story of what this Model R Tire Repair Outfit will do for you.

Makes your work easier.

Saves money by eliminating spoiled material.

Turns out perfect work the first time. No more "second time" jobs.

Pleases your customer because the repairs "stand up."

Builds business, because every Akron-Williams repair is a boost for more.

Space is lacking to list all the good individual features of this Model R Outfit.

But it includes equipment for doing all kinds of casing repairs on auto tires from 2 ½ inches to 5 inches. Includes also an inner-tube vulcanizer, tube deflator, two inside patch vulcanizers and steam generator.

You may need this complete outfit or you may need only one piece of vulcanizing equipment. Whatever you are planning, write us before deciding. Nothing is too large or too small for us to handle. From one sectional vulcanizer to equipment for a tire factory, Akron-Williams machinery is equal to the situation.

Let our consulting engineers help solve your tire repair equipment problems. Write us. No obligation to buy.

The Williams Foundry & Machine Co., Akron, Ohio

Everything in Tire Repair Machinery and Tools

Akron-Williams

Tire Repair Equipment

Mullins Steel Boats Can't Sink

BUILT like a lifeboat—and just as safe. Air-tight compartments fore and aft. Perfect balance, absolute stability—they can't sink.

Pressed steel hull, like a U. S. torpedo boat. Puncture-proof—can't leak, warp, waterlog or dry out. All the buoyancy of a wooden boat, but never needs calking or repairs.

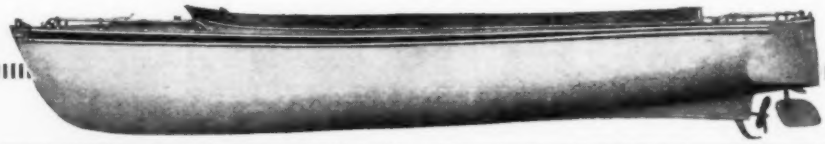
Over 65,000 Mullins boats now in use.

Write for our beautifully illustrated catalog, showing many models of steel and wooden rowboats, canoes and launches — designed by America's foremost naval architects.

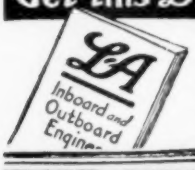
Mullins Outboard Special

Model shown above is ideal for short pleasure trips—fishing, hunting. Has bottom boards, rowing braces, pair of oarlocks and oars. Specially constructed for attaching outboard motor.

THE W. H. MULLINS CO., 655 Franklin St., SALEM, OHIO



Get this LA Engine Book



—it gives valuable information about motor boat engines. It also describes the full line of L-A motors and tells of the 30 days' free trial plan. *Write for your copy today.*

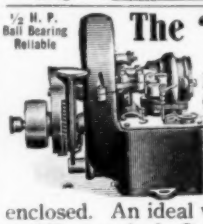
LOCKWOOD-ASH MOTOR CO.
1930 Horton Ave. Jackson, Mich. (22)

Engine User-Agents Wanted

Men wanted in every county to USE, demonstrate and sell "BIG BEN"—wonderful new gasoline engine for every work. Big demand. Liberal profits. Free details and introductory offer. C. Benninghofen & Sons, Department 611, Hamilton, Ohio.

The "Haffa-Hors" Engine

½ H. P. Ball Bearing Reliable



Gas or Gasoline

For running Cream Separators, Grain Graders, Churns, Washing Machines and other small tools. Foot Pedal Starter makes it as convenient as an electric Motor. All moving parts safely enclosed. An ideal woman's engine. Safe, Reliable and Economical. Sold under an absolute guarantee.

See local dealer or write us for Catalog

ELGIN GAS MOTOR COMPANY, 65 River St., ELGIN, ILL.

More Power-Greater Speed!

The **KOBAN** will "run away" from any other rowboat motor because its two cylinders produce more power. In every way, it is the motor for the man who demands real service and efficiency. The **KOBAN does not shake the boat,** because both cylinders fire at the same time, neutralizing the shock.

The Great 2-cylinder

KOBAN ROWBOAT MOTOR

Only by this 2-cylinder opposed construction can you avoid the vibration that makes riding disagreeable, opens seams and ruins rowboats. Special tilting device for shallow water and beaching. For commercial work the **KOBAN** is unequalled. Used by U. S. Government and in 36 foreign countries.

We also make an inboard engine for small boats and canoes. Circular 80 tells all about it.

Write for catalog and full information.

Dealers and local agents wanted.

KOBAN MANUFACTURING CO.
291 South Water St., Milwaukee, Wis., U. S. A.

Makes Good beyond Your Hopes

because it is built on sound engineering principles all through.

Play Safe in Buying a Row-Boat Motor

you can't afford to take any chances. No matter what style of motor you require, there is a

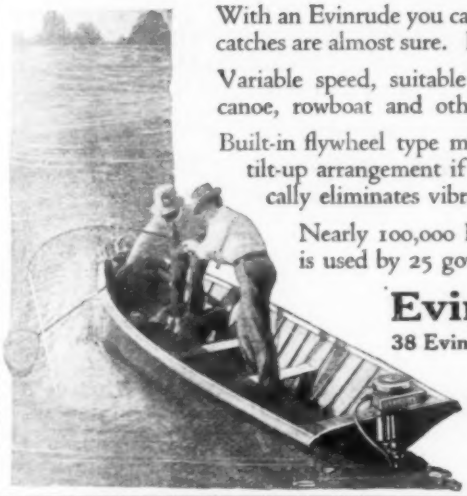
Wisconsin Detachable Row Boat **Motor**

that will suit you. For six years this standard little motor has been making GOOD under all conditions—in the hands of thousands of users. And no wonder, when you examine its mechanical construction. It has a number of exclusive features that you should know about. Write for catalog TO-DAY.

WISCONSIN MACHINERY & MFG. CO.
19 Minor Street, Milwaukee, Wis.

EVINRUDE

Detachable Motor for Watercraft



With an Evinrude you can go quickly, *without rowing,* to the holes where big catches are almost sure. Distance makes no difference to an Evinrude owner.

Variable speed, suitable for trolling. Swift, smooth, flexible power for canoe, rowboat and other craft.

Built-in flywheel type magneto. Automatic reverse. Maxim silencer and tilt-up arrangement if desired. Our special method of balancing practically eliminates vibration.

Nearly 100,000 Evinrudes have already been sold. The Evinrude is used by 25 governments. *Write for Catalog.*

Evinrude Motor Company
38 Evinrude Building **MILWAUKEE, WIS.**

Distributors:
69 Cortlandt St., New York, N. Y.
214 State St., Boston, Mass.
436 Market St., San Francisco, Cal.
211 Morrison St., Portland, Ore.

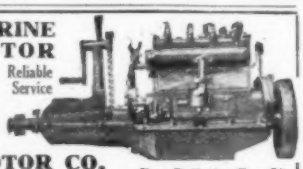
Lost—A valuable key. Dropped it in the dark. Burned my fingers several times with lighted matches. Could have found it **instantly** with an Eveready **DAYLO**—the light that says, "There it is!"

MARINE ENGINES

3 H. P. single and 6 H. P. double cylinder, all iron or copper jacket, aluminum base, light weight, for canoes and small boats.
THE WATKINS MOTOR CO., 828 W. 6th St., CINCINNATI, OHIO

Universal MARINE MOTOR

Reliable Service



9-12 H. P. 4 Cycle 4-Cylinder. Speed range 300 to 1800 R. P. M. Adapted to boats from 14 to 30 feet. Write to

UNIVERSAL MOTOR CO.
OSHKOSH, WIS. **Dept. P**

For Bulletin No. 25 giving full description

Racine Wis

America's Finest Canoe

Because it's built that way
Write for Complete Catalog
RACINE BOAT COMPANY
Dept. 61 **Racine** **Wisconsin**

The Days of Real Sport

A real, heart interest story of fishing back in your boyhood days. Illustrated by Briggs, the famous cartoonist. Gives practical detailed methods, helps and hints on the angling sport of today. Shows full line of South Bend Quality Tackle. Tells the "how" of bait casting. Every sportsman and dealer should have it. Write for it today.

Sent FREE.

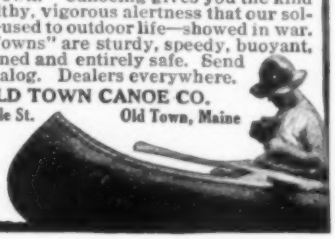
SOUTH BEND BAIT CO.
3587 Colfax Ave.,
SOUTH BEND, IND.

"Old Town Canoes"

Fishing and Canoeing

—fine sport especially when the canoe is an "Old Town." Canoeing gives you the kind of healthy, vigorous alertness that our soldiers—used to outdoor life—showed in war. "Old Towns" are sturdy, speedy, buoyant, trim-lined and entirely safe. Send for catalog. Dealers everywhere.

OLD TOWN CANOE CO.
1866 Middle St. **Old Town, Maine**



"YOU'VE CERTAINLY GOT TO HAND IT TO HER!"
FOR SHE KNOWS A GOOD BRUSH
EFFECTIVE AND ECONOMICAL

WHITING-ADAMS
HOUSEHOLD BRUSHES

Guaranteed to live long and please all users.

Send for Illustrated Literature
JOHN L. WHITING-J. J. ADAMS CO., Boston, U. S. A.
Brush Manufacturers for Over 108 Years and the Largest in the World

DO YOU INTEND TO BUILD?

1919 ART PLAN BOOKS

"Modern Bungalows," containing plans and photos, interior and exterior of 75 new, artistic large and small bungalows. "Modern Homes;" 50 larger residences of distinction and beauty, many 2-story; all proved practical; suited to any climate. Either book postpaid $1; both $1.50. Send TODAY. Newest and best home ideas in America.

AURELIUS SWANSON CO., Building Department
1003 State National Bank Building, Oklahoma City, Okla.

Turn A Valve and Cook

The Oliver Oil-Gas Burner

makes any stove or range a gas stove. No coal or wood. Cooks and bakes better. No fires to start. You regulate flame. Saves money, work, dirt. Burns coal oil (kerosene). Simple, safe, easily put in or taken out. No damage to stove. Lasts a lifetime. Thousands of delighted users. In use 7 years. Write for free literature. AGENTS WANTED

OLIVER OIL-GAS BURNER & MACHINE CO.
1315 N. 7th St. ST. LOUIS, MO.

Make Your Stove A Gas Stove

4-Acre Poultry Farm Only $525
$5 Down. $6 Month

Right in the city of Pentwater, Mich., near Hart, county seat of Oceana; banner fruit county of entire state; partly cleared; some wood; good soil; sand loam; no waste land; plenty small fruit. Only mile to depot, docks and canning factory; small house, well, 100 chickens.

PENTWATER BEACH ASSOCIATION
821 Reaper Block, CHICAGO, ILL.

Mammoth Jubilee Book Free
Picturing 5152 Home Things
Make your own Credit Terms—1 to 3 years' time.
SPIEGEL, MAY, STERN CO., 1108 W. 35th St., Chicago

THIS BUNGALOW $900 CAN BE BUILT FOR

This and many others in my new book, Building Plans for Modern Homes, will save you hundreds of dollars. One of the most complete and comprehensive books of plans ever published by any architect. Fifth edition just off the press. Two hundred and fifty floor plans and photographs of bungalows, etc., costing from $300 up; gives sizes and cost to build. Sent postpaid for $1.00

FREDERICK H. GOWING
ARCHITECT
18 Tremont St., BOSTON, MASS.

The "BEST" LIGHT

Positively the cheapest and strongest light on earth. Used in every country on the globe. Makes and burns its own gas. Casts no shadows. Clean and odorless. Absolutely safe. Over 200 styles. 100 to 2000 Candle Power. Fully Guaranteed. Write for catalog. AGENTS WANTED EVERYWHERE.

THE BEST LIGHT CO., 324 E. 5th St., CANTON, O.

Hand Forged Razor Steel Blades, No. 57

Direct at Factory Prices
This $2 KNIFE 98c Postpaid
Hand Forged Razor Steel Blades

Handy shaped blade makes this knife best for mechanics, sportsmen and farmers; light but strong; re-sharpened easily. Stag handle, German silver finish; blades file tested, hand forged from razor steel and warranted.

Sample 98c. 3 for $2.40 postpaid.

Send for our 100 page List and "HOW TO USE A RAZOR" FREE

MAHER & GROSH CO., 106 A. St., Toledo, Ohio

DIAMONDS WATCHES ON CREDIT

Send for Free Catalog

There are over 2000 illustrations of Diamonds, Watches, Jewelry, etc., **priced unusually low.** Wherever you select will be sent, all shipping charges prepaid. **You see and examine the article right in your own hands.** If satisfied, pay one fifth of purchase price and keep it; balance divided into eight equal amounts, payable monthly.

Liberty Bonds Accepted

Watches

Our Catalog illustrates and describes all the standard world-renowned Watches—solid gold and gold filled cases. Splendid bargains in 25-year guaranteed Watches on credit terms as low as

$2.50 a Month

Special Bargains

Diamond LaVallieres **$10** up
Loftis 7-Diamond Solitaire Cluster Scarf Pins **$75** up
Diamond-set Birth Month Rings - - - **8** up
Diamond Brooches - - **7** up
Diamond Ear Screws - **25** up
Diamond Studs - - - **10** up
Diamond Cuff Links - **5** up
Wrist Watches - - - **20** up
Watches, Gold Filled - **15** up

Diamond Rings

Beautiful genuine Diamond Rings, any style 14-K solid gold mounting, extraordinary values at **$25, $50, $75, $100** and up.

EASY CREDIT TERMS

LOFTIS BROS. & CO., National Credit Jewelers

Dept. A874 (Established 1858) — **100 to 108 North State St., Chicago, Illinois** — **STORES IN LEADING CITIES**

Lights With a Match

"A NEW LANTERN"

Marvelous light—Turns Night into Day—makes and burns its own gas—400 Candle Power. No torch or alcohol needed — **We want live Representatives.** Write for big money making proposition.

ACORN BRASS MFG. CO., 127 Liberty Bldg., Chicago, Ill.

300 Candle Power of Light at a Cost of 1/8c Per Hour

BURNS KEROSENE OR GASOLINE

This lamp generates and burns its own gas from ordinary kerosene. "QUICKLIT" gasoline lamps can be lit with an ordinary match like city gas. Write today for illustrated catalog of our complete line of kerosene and gasoline lamps, lanterns and lighting systems. *Agents Wanted*

The Nagel-Chase Mfg. Co., 176 E. Erie St., Chicago

Cleartone Phonographs

$4.00 to $200.00 Retail

Our Sundry Dept. offers Needles 45c per thousand in lots of 500,000. Motors $1.35 to $14.75 each. Tone Arms and Reproducers $1.30 to $5.75 per set. Main Springs 20c to 90c each. Records, Needles, Sapphire Points and Parts at reasonable prices. Write for our 84 page catalogue, the only one of its kind in America, illustrating 33 different styles of Talking Machines and over 500 different Phonographic Parts.

LUCKY 13 PHONOGRAPH COMPANY
Export Dept. 46 H, E. 12th Street, N. Y., U. S. A.

SMALL ENGINES

Perfected Gasoline Engines—½, 1 and 1½ h. p.—for Farm and Shop use. Price $27.50 and up. Also

WASHING MACHINES

We ship on trial. Send for Booklet and Special Offer.

KIEVERKROPP ENGINE CO.
1224 18th St. RACINE, WIS.

STARTER for FORD CARS

Typewriter Sensation

Free Trial

Use as You Pay

Only $4.00 a month until the low total price of $53.15 is paid, and the machine is yours.

This is absolutely the most generous typewriter offer ever made. Do not rent a machine when you can pay $4.00 a month and own one. Think of it—Buying a $100.00 machine for $53.15. Cash price, $50.35. Never before has anything like this been attempted.

Standard Visible **SMITH PREMIER**

MODEL 10

Perfect machines, Standard size, full 84 character one motion keyboard. The entire line of writing completely visible at all times, has the tabulator, the two-color ribbon, with automatic reverse, the back spacer, ball bearing type bars, ball bearing carriage action, in fact every late style feature and modern operating convenience. **Comes to you with everything complete; tools, cover, operating book and instructions, ribbon, practice paper—nothing extra to buy. You cannot imagine the perfection of this beautiful reconstructed typewriter until you have seen it.** I have sold several thousand of these perfect latest style Model No. 10 machines at this bargain price and every one of these thousands of satisfied customers had this beautiful, strictly up to date machine on five days' free trial before deciding to buy it. I will send it to you F. O. B. Chicago for five days' free trial. It will sell itself, but if you are not satisfied that this is the greatest typewriter you ever saw, you can return it at my expense. You won't want to return it after you try it—you cannot equal this wonderful value anywhere.

You Take No Risk—Put in Your Order *Now*

When the typewriter arrives deposit with the express agent $9.15 and take the machine for five days' trial. If you are convinced that it is the best typewriter you ever saw, keep it and send me $4.00 a month until our bargain price of $53.15 is paid. If you don't want it, return it to the express agent, receive your $9.15 and return the machine to me. I will pay the return express charges. This machine is guaranteed just as if you paid $100.00 for it. It is standard. Over one hundred thousand people own and use these typewriters and think them the best ever manufactured.

The supply at this price is very limited, the price will probably be raised when my next advertisement appears, so don't delay. Fill in the coupon today—mail to me—the typewriter will be shipped promptly. There is no red tape. I employ no solicitors—no collectors—no chattel mortgage. It is simply understood that I retain title to the machine until the full $53.15 is paid. You cannot lose. It is the greatest typewriter opportunity you will ever have. **Do not send me one cent. Get the coupon in the mails today—sure.**

HARRY A. SMITH, 510, 218 N. Wells St., CHICAGO

H. A. SMITH, 510, 218 N. Wells Street, Chicago, Ill.

Ship me a No. 10 Smith Premier F.O.B. Chicago, as described in this advertisement. I will pay you the $44.00 balance of the **special** $53.15 purchase price, at the rate of $4.00 per month. The title to remain in you until fully paid for. It is understood that I have five days in which to examine and try the typewriter. If I choose not to keep it I will carefully repack it and return it to the express agent. It is understood that you give the standard guarantee for one year.

Name .....

Address .....

.....

Spending Nickels

is the great American pastime—the outdoor sport that rivals baseball. Every form of amusement has at some time or other had its popcorn and peanut concessions. Today at prominent corners, confectioneries, drug stores, department stores and street vendors, thru the 20th century salesmanship of sight, smell and taste, Popcorn and Peanuts have taken a new grip on the American appetite and have made certain and easy the way of

"Getting the Nickels With a KINGERY"

Each nickel represents 3½ cents in profit. Can you name a business with less capital involved and risk entailed? We make it easy to start a business of your own.

$9 Down Balance on deferred payment plan starts you in business tomorrow with our No. 345 KINGERY. Machine complete $36.00.

"A Kingery for each stage of your growth."

Just a line from you brings our catalog

Kingery Mfg. Co., Dept. A Cincinnati, O.

Established 1881

American Box Ball Built This Home!

Small Investment Big Rewards

STARTING with $150, C. T. Patterson of Illinois, made $800.70 in the first two months from American Box Ball. Now operates eight alleys. Nine years of success. American Box Ball Bowling is the sport that never grows old. Today's opportunity is greater than ever. Closing 300,000 saloons brings nation-wide demand for Box Ball Alleys.

Released soldiers want this delightful exercise. Workers, merchants, everyone wants it. Box Ball fascinates old and young. $12 to $18 a day from two alleys is common. Hundreds earn more. Do as Patterson and many others have done.

Little money to start. Part down—balance out of profits. We help you. This is the right time to start. Write for our money-making proposition. Send now.

American Box Ball Co.
522 Van Buren St.
INDIANAPOLIS, IND.

THE RESURRECTONE

TRADE MARK REGISTERED

Get Rid of That Nasal Twang on *Your* Phonograph

This remarkable reproducer gives sounds their proper expression and rhythm. Its naturalness and warmth of color makes the sound a true "resurrection" of the original.

Applicable to any machine. You'll be delighted with it. Send $10 if nickel plated, or $12.50 if gold plated, and the RESURRECTONE will be sent postage paid. State make of instrument. Satisfaction guaranteed or money refunded.

Heffay Talking Machine Co., Dept. 606, 3 W. 29th St., New York City

½ Price $2.50

SEND NO MONEY

If You Can Tell it from a GENUINE DIAMOND Send it back

To prove that our blue-white MEXICAN DIAMOND closely resembles the finest genuine South African Diamond (costing 50 times as much), with same DAZZLING RAINBOW-FIRE, (guaranteed 20 yrs.) we will send this Ladies Tiffany Style Ring with one carat gem, (Catalogue price $4.98) for **Half Price to introduce, $2.50,** plus war tax, 13c. Same thing but Gents, Heavy Tooth Belcher Ring, (Catalogue price $6.26) for $3.10, plus war tax 15c. Mountings are our finest 12 karat gold filled. Mexican Diamonds are GUARANTEED FOR 20 YEARS. **SEND NO MONEY.** Just mail postcard or this ad., state size and we will mail at once C. O. D. If not fully pleased, return in 2 days for MONEY BACK, less handling charges. Act quick; offer limited; only one to a customer. Write for FREE Catalog. AGENTS WANTED

MEXICAN DIAMOND IMPORTING CO.
Dept. ET7 Las Cruces, N. Mex.

The choice of American workmen for nearly half a century—because THEY *WEAR LONGEST*—

SWEET-ORR CLOTHES TO WORK IN

Be a Finger Print Expert

Police departments, factories and industries everywhere are adopting this system of identification. Experts needed at once. You can train yourself in spare time at home. Write for details.

Free Book—Write Valuable and interesting book on finger prints sent absolutely free and prepaid. Also details of special limited offer. Write at once, while this offer lasts.

UNIVERSITY OF APPLIED SCIENCE
Desk A119 1772 Wilson Avenue, CHICAGO

The Pro-phy-lac-tic is the ONE Tooth Brush in universal use today—everywhere

Two Shots at Fifty Feet

Exact reproduction of bullets after hitting an iron target at range of fifty feet. These shots were from the

BENJAMIN AIR RIFLE

The Gun That Never Loses Shooting Force

Here is an air gun designed along lines that put it in a class by itself for accuracy, efficiency and genuine service. The Benjamin is the only real pump gun ever invented. It operates on a pneumatic principle that gives his gun a shooting range of extraordinary distance. Will last for years and still retain its original shooting force.

Safe—Sure—Satisfying

The Benjamin cannot be accidentally discharged; only acts when the trigger is pulled. This assures absolute safety.

$3.75 Postpaid in U. S. and Canada

Sold by Dealers Everywhere

Your Dealer will gladly give you a demonstration of the action and remarkable shooting force of this gun. **Write now** for folder giving detailed information on this most wonderful air rifle.

Benjamin Air Rifle & Mfg. Co. 615 N. Broadway, ST. LOUIS, MO.

Send for a Complete Catalogue of

MASONIC BOOKS Jewelry and Goods

REDDING & CO.

Publishers and Manufacturers

Dept. P 200 Fifth Avenue, New York

Bell Telephone highways make you the near neighbor of your farthest-away fellow-citizen.

AMERICAN TELEPHONE & TELEGRAPH CO. AND ASSOCIATED COMPANIES

One Policy *One System* *Universal Service*

100% EFFICIENT

The Argus Moistener

is practical and cleanly, neat, attractive and convenient. It does not smear up the fingers nor soil the stationery. Every business man should have one on his desk.

Price $1.50 Postpaid. Agents Wanted Everywhere

ARGUS MANUFACTURING CO.
Dept. 110 402-408 N. Paulina St., CHICAGO, ILL.

SUPERIOR SINCE 1904

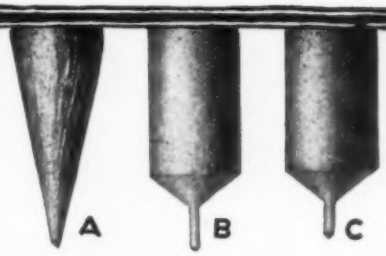
Over 100,000 in Use

Mostly sold through recommendation. For PERSONAL DESK or GENERAL OFFICE. It checks mental calculations. Buy through your Stationer. Write for 10-day trial offer.

E. GANCHER, A.A.M. Co.
148 Duane Street, NEW YORK
CANADIAN AGENCY

AGENTS WANTED

Golden Gem PORTABLE Adding Machine $12



They replace steel phonograph needles!

SONORA Semi-Permanent Silvered Needles are for use on ALL MAKES of steel needle records. They *play 50 to 100 times,* mellow the tone, are more economical, more convenient, save constant needle changing, and increase the life of the records.

THE INSTRUMENT OF QUALITY

Sonora

CLEAR AS A BELL

Semi-Permanent Silvered

NEEDLES

Study these photomicrographs. Fig. A shows an ordinary steel needle after playing one record. Notice that the point is worn off. Fig. B shows Sonora Needle after playing one record. No wear is perceptible. Fig. C shows Sonora Needle after playing over 50 records. Needle has shortened but is still in perfect playing condition.

3 Grades: Loud—Medium—Soft
30c per card of 5. In Canada 40c.

FREE!

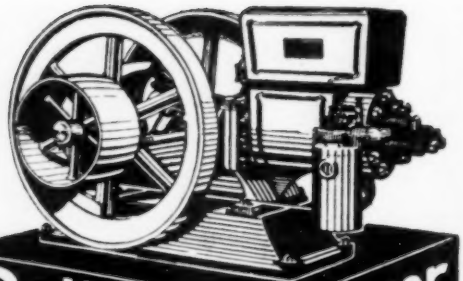
Sample Sonora Needle will be sent FREE on request. Write for it *today.* Note how many times it plays.

Sonora Phonograph Sales Company, Inc.

GEORGE E. BRIGHTSON, PRESIDENT

279 Broadway, *Dept. E,* New York
Toronto: Ryrie Building

CAUTION! Beware of similarly constructed needles of inferior quality



Reliable Power

10 Year Guarantee

More power, per gallon, from cheap kerosene than from high-priced gasoline. **Easy to start in any weather.**

Prompt Shipments **OTTAWA** 90 Days' Trial

Kerosene Engines

Save big money on price and half on fuel. For all outdoor and indoor work. Thousands in use. All sizes and styles from 1½ H-P to 22 H-P. Complete mounted saw rigs or saw frames separate, suitable for mounting on your own trucks.

Book Free Easy to understand—Explains all you want to know about engines.

Write for Present Low Prices.

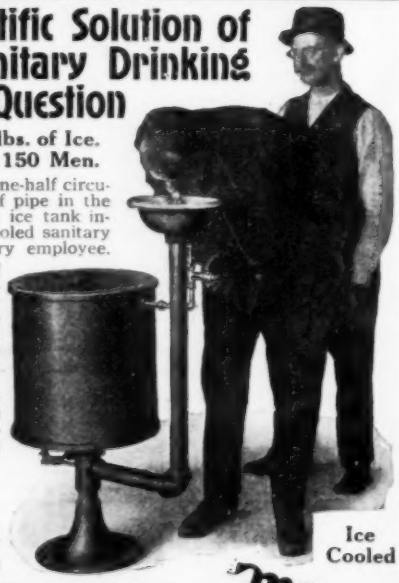
OTTAWA MFG. CO., 534 King St.
OTTAWA, KANSAS

A Scientific Solution of the Sanitary Drinking Water Question

Holds 75 lbs. of Ice.
Supplies 150 Men.

Fifteen and one-half circulating coils of pipe in the cork-jacketed ice tank insure an ice-cooled sanitary drink to every employee.

The quality of the ice is immaterial, as it does not come into contact with the water. This construction reduces the amount of ice and water required to a minimum.



Ice Cooled

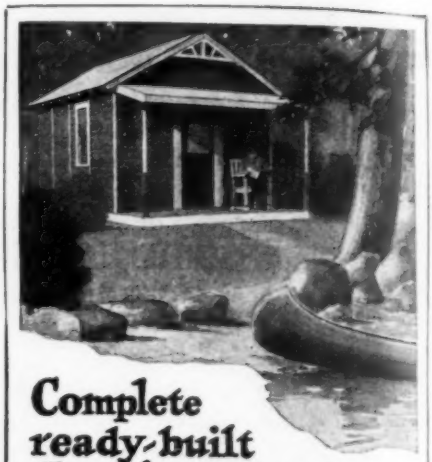
Send for Our Complete Catalogue

showing our line of Wash Bowls, Metal Lockers, All Steel Stools and Chairs with Inset Wood Seats, Stock and Storage Racks, Metal Shelving, Metal Vault Fixtures, Improved Soda Kettles, 40 and 60 gallons, Water Heaters and Instantaneous Mixers, Bubbling Drinking Fountains, Work Benches and Bench Legs, Drawing Stands, full line of Plumbing Fixtures, etc.

MEEco
Met al Equipment For Shop And Factory

Manufacturing Equipment and Engineering Co.
136 Federal Street **Boston, Mass., U. S. A.**
Works and Mail Address, Framingham, Mass.

Please Mention Popular Mechanics



Complete ready-built Carefre Cottage-

$239 —

Comes in sections—including floor.
You can put it together with a wrench.
Paint, glass—everything included.
Size, 12 feet x 16 feet.
Send today for illustrated booklet.

Address, **Carefre Cottage Dept.**
B. H. & S. COMPANY
Erie R. R. & Sycamore St., Buffalo, N.Y.

SMOKE A

WDC TRADE MARK **Wellington**

THE UNIVERSAL PIPE

WM. DEMUTH & CO., NEW YORK

B-E-T-T-E-R MUSIC

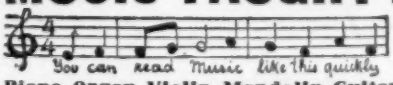
Williams' Sounding Board

Placed under record on any disc phonograph.

SEND $3.00 TO

O. B. WILLIAMS CO., Seattle, Wash. U. S. A.
Manufacturers Sash and Doors

MUSIC TAUGHT FREE



IN YOUR OWN HOME

Piano, Organ, Violin, Mandolin, Guitar, Banjo, etc.

Beginners or advanced players. One lesson weekly. Illustrations make everything plain. Only expense about 2c per day to cover cost of postage and music used. Write for **FREE** booklet which explains everything in full.

AMERICAN SCHOOL OF MUSIC, 50 Lakeside Building, CHICAGO

Wear Absolutely Waterproof Steels

Cost less than leather, wear 3 to 6 times longer, are lighter, easier, stronger. Stop big shoe bills. Eliminate repair bills. Stop foot troubles. Prevent Colds, Rheumatism, Corns, Bunions. Keep feet warm and dry in snow, rain, mud, slush. Never change shape — comfortable always. **FREE Shoe Book Tells All. Write Today**

N. M. RUTHSTEIN, Vice-Pres.

STEEL SOLE SHOE CO., Dept. A52 Racine, Wis.

$388 BUYS THIS "PRESTO-UP" Bolt-Together House

The Wonder Buildings of the Age

GUARANTEED

Purchased after most rigid inspection by some of the largest Steel, Coal and Industrial Corporations in the United States. You are not experimenting. "PRESTO-UP" Bolt-Together Houses are patented, manufactured exclusively by us and sold at money saving prices.

Seven different types of walls to choose from. Wind and weather proof. Invisible joints inside and out. Extremely simple to bolt together. Wonderful strength. Better construction than regularly constructed houses. Exceptionally good lumber. Cement coated nails. Fifteen Year Guaranteed Slate Coated Roofing. Well painted, and best of all, neat in appearance and so simple to bolt together that it is a pleasure to do the work.

Send for CATALOG FX-7 TODAY

Houses—Garages—Barns—Out Buildings, etc.

Also Harris Fresh Air Canvas Houses

HARRIS BROTHERS CO., Chicago

Be a Finger Print Expert

Police departments, factories and industries everywhere are adopting this system of identification. Experts needed at once. You can train yourself in spare time at home. Write for details.

Free Book—Write Valuable and interesting book on finger prints sent absolutely free and prepaid. Also details of special limited offer. Write at once, while this offer lasts.

UNIVERSITY OF APPLIED SCIENCE
Desk A119 1772 Wilson Avenue, CHICAGO

Learn to PAINT SIGNS and SHOW CARDS

I teach you personally, by mail, in a short time. Oldest and largest School. Big field, work interesting. You can

EARN $18 TO $45 A WEEK

Fritzner, Minn., wrote: "Did job after first lesson, got $10, profit $7.05." Crawford, B. C., says: "Earned $200.00 while taking course." Get literature, samples, guarantee — all FREE.

DETROIT SCHOOL OF LETTERING
Established 1899. 426 D. S. of L. Bldg. DETROIT, MICHIGAN

All Worsted Serge Pants Made To Order $1.65

Ask local tailors to make a pair of fine blue serge pants for less than $5 or $6 and see what they tell you. And yet our price is only $1.65. We positively guarantee a perfect fit and your complete satisfaction or **money back.** Remember we make all Suits, Pants and Overcoats tailor-made to order, to your individual measurements and no extra charge of any kind for novelty features.

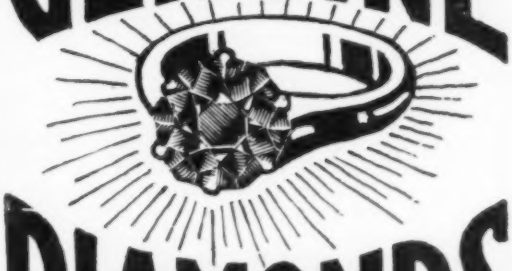
Wonderful New Plan The greatest plan ever thought of for high class made-to-order suits and overcoats at lowest, bedrock prices. By this plan you get a tailor-made-to-order suit in addition to earning a handsome income in your spare time. Send postal today for most sensational, most beautiful and interesting book you have ever seen.

Express Prepaid

Moving Picture Tie-Up Scenes of Theda Bara in Cleopatra, Annette Kellerman in Garden of the Gods. Scores of others in many colors. Also greatest collection of woolen samples and fashions ever shown. Don't send a cent. A postal brings everything—explains all. Most perfect measurement outfit ever devised. Write quick.

Reliable Tailoring Co., 377 S. Peoria St., Chicago

GENUINE DIAMONDS



Weighing 3/4 CARAT $35

AMAZING VALUE!

Starting with this diamond solitaire weighing 3/4 carat for $35.00 we are offering the largest and strongest list of diamonds ever offered in the country. This special is but one of the many thousands of equally remarkable values described in our 280-page catalog—sent free on request. When you buy diamonds from a retail jeweler you pay three unnecessary profits and this is absolutely eliminated when you buy from us.

Diamond Importers and Cutters

I. Press & Sons have startled the diamond world by importing diamonds in the rough, cutting them on their premises and selling direct to the public at diamond cutter's prices. WE GIVE THE BIGGEST DIAMOND VALUES IN THE COUNTRY.

MONEY BACK IN FULL ANY TIME WITHIN ONE YEAR

To protect your investment in any diamond you buy from us, we give you an Ironclad Legal Money Back Guarantee, which makes disappointment impossible. This guarantee gives you the right to **return the diamond at any time within one year for full cash refund,** or you can return the diamond at any time for full value to apply on any exchange. We also state exact carat weight and value.

280-PAGE 1919 CATALOG FREE!

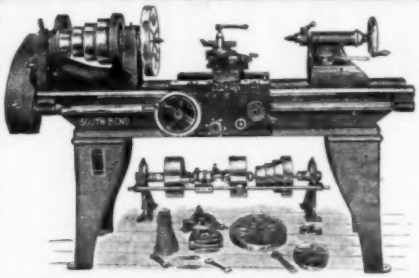
The most complete and wonderful diamond, watch and jewelry book ever issued. Contains 280 pages brimful of the biggest values ever offered. Gives valuable facts on diamonds that will enable you to buy as safely as any expert. Quotes lowest wholesale prices on watches and jewelry. A copy of this valuable book will be mailed to you FREE upon receipt of your name and address.

Write For Special Watch Bargains

I. PRESS & SONS
IMPORTERS AND CUTTERS OF DIAMONDS
WHOLESALE JEWELERS

Write For Big Free Catalog Today

801-N I. PRESS & SONS BLDG.
PHILADELPHIA, U. S. A.



South Bend Lathes

For the Machine and Repair Shops

13" Lathe	$256.00	18" Lathe	$ 600.00
15" "	336.00	21" "	771.00
16" "	432.00	24" "	1085.00

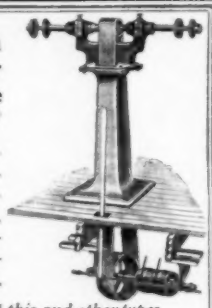
Made with straight or gap bed. Price includes equipment as shown in illustration. **South Bend Lathes have been on the market twelve years. Over 20,000 in use.** EST. 1906.

Free catalog mailed on request.

How to Run a Lathe An 80-page book, postpaid to any address for ten cents, silver or stamps accepted.

SOUTH BEND LATHE WORKS, 423 E. Madison St., SOUTH BEND, IND.

Did you ever wish to drive a Grinder or Polishing machine from the floor below?



If so you probably had considerable trouble getting a machine arranged for the purpose. The designer of the ST. LOUIS line has had the experience, so knew how to eliminate all the annoying features.

Catalogue No. 15 tells all about this and other types.

SAINT LOUIS MACHINE TOOL CO.

906 Loughborough Avenue (Cable Address MACHINTOOL) St. Louis, U. S. A.

THE STANDARD MEDIUM PRICED

SEBASTIAN

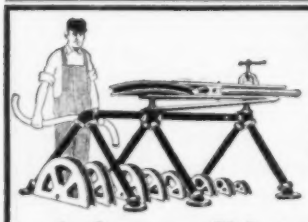
LATHE

FOR 30 YEARS

10 to 15" swing. Write for catalog.

THE SEBASTIAN LATHE CO.

107 Culvert St., Cincinnati, O., U. S. A.



WONDER

10 Models

Pipe, Tubing and Solid Bar Benders

Bend all sizes of standard or double thick steel, wrought iron, brass and copper pipe from 1/8" to 6"; tubing from 1/2" to 7"; round, square and twisted solid stock from 1/4" to 3".

A few well-known users:

United States, French and English Govts.; Aberthaw Construction; J. G. White Eng. Corporation; Western Electric; General Electric; Standard Oil Company *and hundreds of others.* *Write for Catalog.*

American Pipe Bending Machine Co.

Manufacturers

59 Pearl Street Boston, Mass, U. S. A.

1/4 H.P., 110 volts, A.C. 60 cycle, single phase, 1750 R.P.M.

MOTORS

We have 1000 NEW WASHING MACHINE MOTORS. These are of standard manufacture and carry the regular factory guarantee. Shipped in original boxes. Complete as cut.

Bought from Bankruptcy Stock

Suitable for operating Coffee Grinders, Cream Separators, Butter Workers, Air Compressors, Small Lathes, Etc.

Mail $3.00 cash or Money Order. We will send C.O.D. subject to full examination.

MONEY BACK GUARANTEE

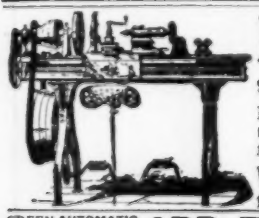
$18.50 EACH

Special Quantity Prices

MANUFACTURERS DISTRIBUTOR

BARGAINS in Small Motors and Generators. Write for Catalogue

CHAS. H. JOHNSTON - West End - Pittsburgh, Pa.



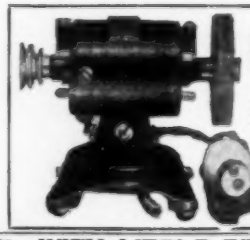
LATHES

9 to 18-inch Swing

List price $100 and up according to size. When ready to buy send for Lathe Catalog and prices.

W. F. & John Barnes Co.

100 Ruby Street, ROCKFORD, ILL.



MECHANICS' UTILITY

Motor Grinder

A Time-Saver and Money-Maker For Shop, Factory, Garage or Home

Attach to any electric light socket or you have a power unit which will do grinding of all descriptions as well as run small machinery. Can be furnished with chuck and buff for buffing.

Type B—Complete with 6"x1/2" Emery Wheel, $15.50. Order today.

RACINE UNIVERSAL MOTOR CO.

304 S. Dearborn Street, Chicago, Ill.

GREEN AUTOMATIC MACHINE

ADD TO YOUR INCOME

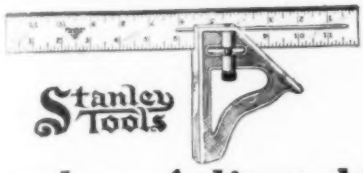
WITH LITTLE EFFORT **$5 to $10** A DAY MADE EASY WITH

New Improved Green Automatic Machine

"AMERICAN" Key Cutter

Sharpens, Hones and Strops all kinds of safety razor blades, in one operation, from four to six blades per minute. For both Quality and Quantity, this machine is in a class by itself. There is nothing like it on the market. Let us send you our free booklet explaining everything, including the **"AMERICAN" Key Cutter**—cuts square, angular or round slots.

AMERICAN SHARPENING MACHINE CO. (Inc.), Dept. 6, 184 W. Washington St., CHICAGO



Stanley Adjustable Try and Mitre Square No. 21

One of the handiest tools in a Carpenter's Kit. Especially useful for doing short work about windows, doors, etc., or in putting on butts or locks.

The *Blade* is adjustable and as it can be reversed, provides any size of try or mitre square within the capacity of the tool. In reversing, it is not necessary to remove the blade from the handle, consequently the tool is always assembled and ready for use.

The locking device is such as to insure the blade being firmly and accurately secured at any point desired. The edges of the Blade are machined, graduated in 8ths, 16ths and 32nds of inches, and the tool is square inside and out.

It is also an excellent depth and marking gauge. Both Handle and Blade are nickel plated. Made in three sizes.

Special Circular Upon Request

STANLEY RULE & LEVEL CO.
NEW BRITAIN, CONN. U.S.A.

THE MIDGET SLIDE RULE

has many exclusive features. It handles three factors at one setting. It has a Log-Log Scale, Polyphase or Inverted Scale, Addition and Subtraction Scale, Square Root Scale, Log. Scale and Binary Scale and the Midget is equivalent to all of these types of straight slide rules. This rule will add and subtract, multiply and divide fractions and mixed numbers without changing them to decimals. Also gives Logarithms, Sines, Tangents, Cosines, Cotangents and the decimal equivalents of fractions. An instruction book, "The Slide Rule Manual", 16 pages, 12 illustrations, is sent with each rule. Diameter of rule, 4". Logarithmic Scale, 12" long. Made in two models: Metal (white coated steel), **$1.00** each; White Celluloid, **$1.25** each. Genuine Leather Carrying Case, **50c** extra. Circulars Free. Your money back if you are not satisfied.

GILSON SLIDE RULE CO., Niles, Mich.

Pilliod Tool Cases Excel

Machinists and Tool Makers find them most satisfactory in construction, appearance, service and price. **Immediate Shipment.**

Booklet describing 20 styles on request.

THE PILLIOD LUMBER CO.
Dept. B SWANTON, OHIO

CRESCENT WOOD WORKING MACHINERY

satisfies wood working machinery operators who know the best and who expect their machines to be strictly high grade. Ask today for our free catalog of band saws, jointers, saw tables, planers, planers and matchers, disk grinders, swing saws, post borers, shapers, variety wood workers, hollow chisel mortiser, universal wood workers, table cut off saws.

THE CRESCENT MACHINE CO.
93 Columbia St. Leetonia, Ohio

MOSSBERG

ALL STEEL WRENCHES AND TOOLS

Leadership in the manufacture of wrenches and tools has been gained and maintained through adherence to principles of manufacture which insure to the user of Mossberg products the utmost in value and in service.

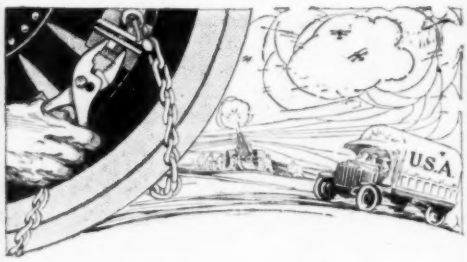
Illustrated here are:

Mossberg All Steel Socket Set No. 45, containing an assortment of 15 sockets, universal joint and speed brace.

K-9 adjustable wrench; also solid handle wrenches 6 and 12 inch, with speed brace.

Send for complete catalog and particulars.

FRANK MOSSBERG CO.
WRENCHSMITHS FOR 20 YEARS
ATTLEBORO, MASS. U.S.A.



3 out of 4

An army officer in the Motor Truck Division said, "75% of our repairs can be made with *one* tool—a pair of

Red Devil

REG. U.S. PAT. OFF.

"Thin Nose" Pliers

No. 1024

These thin-nose, slip-joint pliers are the one indispensable tool for automobiles, tractors, and farm machinery. They get into close corners *and hold;* are adjustable to grasp anything from a fine wire to a good-sized nut or pipe; have screw-driver end and wire cutters.

No. 1024 is just one of the many styles of "Red Devil" Pliers—ask your hardware dealer to show you the kinds best adapted to *your* use.

SMITH & HEMENWAY CO., INC.

260 Broadway, New York, N. Y.

Factories: Irvington, N. J.

"Red Devil" is the Expert Mechanic's guide to Known Quality in Pliers, Electricians' Tools, Hack Saw Frames and Blades, Auger Bits, Chain Drills, and other Hand Tools, all of a class with "Red Devil" Glass Cutters, the biggest sellers in the world.

Please Mention Popular Mechanics

Automobilist's hands after stopping spring squeaks by using a spring spreader and injecting graphite and oil.

—there's a better and cleaner way now

No need to jack up car, to loosen clips, to force leaves apart or to dirty hands.

Simply buy a Handy Oil Can full of 3-in-One (25c at all stores) and squirt oil along edges of leaves and on ends of spring.

That's all—for 3-in-One is the most penetrating oil in the world and works its own way to every friction point.

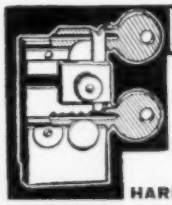
Oil your springs with 3-in-One once a week. Your car will ride easier if you do; your springs won't squeak, and the chances of spring breakage will be reduced 85%.

3-in-One also keeps magnetos in perfect condition, makes Fords crank easier and keeps the body of your car bright and shiny. For numerous other motorists' uses see special

Automobile Circular

which we will send free, together with a sample of 3-in-One. Write now.

Three-in-One Oil Company
165 CNM. Broadway, New York



Duplicate Keys

for all Yale and similar Locks made in one minute with Harrison M. I. P. Key Filing Machine. No misfits. Thousands in use. $5.00 net. Special diamond-shaped files for angular cut keys, 60c each. Harrison C. K. Key Clamp duplicates all common and lever keys without a caliper. Price, $2.00. Parcel post prepaid.

Money returned if not satisfactory.

HARRISON & CO., 81 New St., New York

DISSTON SAWS

"The Saws Most Carpenters Use"

HENRY DISSTON & SONS, INC.

PHILADELPHIA, PA. Canadian Works: Toronto, Can.

Protect Your Tools in a UNION Tool Chest

Keep them safe from knocks, bangs, rust. Have each one in its place; save time and losses. 500 mechanics in one shop of Bethlehem Steel Co. use UNION Tool Chests; strongest, most convenient, most attractive. 19 styles and sizes. GUARANTEED satisfactory or money refunded. Write for catalog, prices, and name of nearest dealer.

UNION TOOL CHEST CO., Inc., 22 Mill Street, Rochester, N. Y.

GOODELL-PRATT

1500 GOOD TOOLS

USE HB BALL BEARING ELECTRIC MOTORS

HB Electrical Motors Save Power

Use Ball Bearing equipped HB Motors, as they save you a substantial amount each month on your power bills. They are absolutely trouble-proof, economical, amply designed, just right for your requirements — 1 to 15 h.p. They substantially lower your power costs. Easy to install and operate. Require practically no attention

$20.00 gives you an HB Ball Bearing Motor. The balance on easy terms. Suits your requirements.

Let our engineering department advise you. Send in your problems. State kind of machinery you wish to run and type of current available. We can also furnish battery charging Outfits, Lighting Generators, etc. Pin this ad to your letterhead and mail for further information today.

HOBART BROTHERS COMPANY
Box M6 Troy, Ohio
Successful Manufacturers Since 1893

TOOL CHESTS

For Up-to-Date TOOLMAKERS and MACHINISTS

We carry the finest and most complete line of mechanics' tool chests and tools in the country. We guarantee to please you or refund money. *Write for circulars.*

J. M. WATERSTON
75 Woodward Ave., DETROIT, MICH.

A Blast Without a Blower

The Lane Burner brings cherry red for hardening in one-third time required by Bunsen. Pays for itself in day's use. Adopted by all advanced shops. Necessity where quick, intense heat is needed. Invaluable for hardening, soldering, brazing, annealing, tempering, melting; experimental laboratory, research work. Butterfly Valve regulates heat from moderate to blast of more than 2000 degrees. Shut-off Valve, Ever Ready Pilot, gas connector that stays connected. Tight gas tank, fixed combustion chamber. **Descriptive circular and prices on request.**

LANE MANUFACTURING COMPANY, Inc.
Famous Lane Burners 21 Vose Ave., SOUTH ORANGE, N. J.

MANNING *Speed-grits*

QUALITY ABRASIVES that are entering American factories everywhere. Write for booklet telling many curious facts about them. **Manning Abrasive Co., Inc., Troy, N. Y.**

"Interlox"

MASTER SLIDE RULE

If not at dealer's, send his name and 20c per foot any length, 2 to 8 ft., and we'll send rule prepaid.

MASTER RULE MFG. CO., INC.
(Formerly Dahl Mfg. Co.) 841-43 E. 136th St., New York City
Liberal Proposition for Dealers and Agents

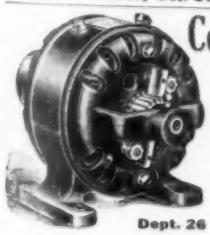
BIG CHANCE FOR AGENTS

You can earn BIG MONEY

selling the most complete line of guaranteed transparent handle Knives and Razors with Photo, Name and Lodge Emblem — also full line of cutlery. Write today for catalogue and terms

Golden Rule Cutlery Co., 212 N. Sheldon St., Dept. 20, Chicago, Ill.

County Agents Wanted



FOR OUR LINE OF

Electric Farm Lighting Plants

Good money-making proposition, liberal commission. $300 required. Write for terms.

We also sell **Garage Equipment, Storage Batteries, Battery Charging Generators, Motors, Tungar Rectifiers, etc.** Catalog free.

WATSON ELECTRIC COMPANY
Dept. 26 122 Michigan Ave. CHICAGO

BROWN & SHARPE MACHINISTS' TOOLS

Universal Bevel Protractor

Combination Square

Is it serviceable?

Will it give as good service five years from now?

These are the questions you ask when buying precision tools.

If a concern has supplied tools to satisfied machinists for three generations, the answer is evident, and points out to you the tools to buy.

BROWN & SHARPE
Machinists Tools

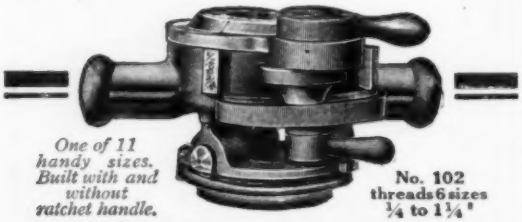
We have a catalog that will interest you — send for No. 27

Vernier Caliper

"The Mark that Guarantees Quality"

B&S

OSTER BULL-DOG DIE STOCKS



One of 11 handy sizes. Built with and without ratchet handle.

No. 102 threads 6 sizes ¼ to 1¼"

A Pipe Threading Outfit in One Tool

Each Bull-Dog threads from 4 to 8 sizes of pipe. And each embraces the 5 big Oster features which take all the hard work and bother out of hand pipe threading. (1) self-locking dies, (2) self-centering guides, (3) Dies open after cut, no "unwinding." (4) No loose bushings. (5) No small breakable parts.

THE OSTER MFG. CO.
2100 E. 61st Street Cleveland, Ohio, U. S. A.
THE COUPON BRINGS COMPLETE CATALOG

Send catalog of 47 hand and power threading tools.

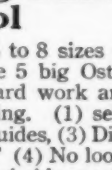
Name.....

Address.....

City.....

State.....

SKAT



Write for Sales Proposition
SKAT CO., Hartford, Conn.

Boston Garters

WORN THE WORLD OVER

Special KON-VER-TER Slide Rule

The Hamilton improved circular slide rule has over 8000 graduations and over 1800 figures and letters on it, and is an Engineer's hand book and slide rule combined. It is 5.4 inches in dia. It will subtract, divide, multiply, and add fractions or decimals of an inch; can be used as a decimal equivalent table, constructed of three disks and double transparent celluloid rider. Decimal equivalents given to six places in figures; gives sines, co-sines, tangents, co-tangents, secants, co-secants, versed sines, co-versed sines, square, cube, and fifth roots with all their powers; finds the area, circumferences and dia. of circles directly. The Log. scale has 1000 graduations. The DE LUXE rule may be bent double without injury; try this with rigid material such as metal; has no clumsy operating attachments and will work proportions. The KON-VER-TER is artistic as well as useful. In use all over the U. S., Canada, Mexico, Cuba, Porto Rico, Panama, Bermuda, Hawaii, Philippines, Australia, and New Zealand. Instructions with each rule. Beautiful gold embossed black leatherette case, 50c extra. **Plain Utility Rules, $1.00; Special De Luxe Rules, white ivory celluloid, $2.50 ppd.**

J. C. Hamilton & Co., Dept. E, 7 Water St., Boston, U.S.A.

Please Mention Popular Mechanics

There is a Fortune in Drilling Wells

Men with no previous drilling experience write us they clear $25 to $75 a day with Armstrong Drills — drilling water and oil wells. Drillers everywhere are months behind their orders! It's a chance of a lifetime. Farmers, engineers, threshermen — men in all walks of life — are grasping this remarkable chance to get into this big paying business. Get started at once.

Armstrong Machines

drill more hole at less cost than any machine on the market. The ARMSTRONG—built for service since 1867—furnished in traction or non-traction style — operated by our famous special kerosene drilling engine.

The **Armstrong Drill** is a marvel of simplicity, efficiency and durability. 3 right hand levers complete every operation. Many beginners average 50 ft. per day. On hard tests it has averaged 92 ft. per day through solid rock, using only 6½ gals. fuel—figure the profit possibilities out for yourself. Get full information. Special consideration to men returning from Service.

Don't pass by this opportunity.
Write right now for Free Book.

ARMSTRONG MFG. CO.
514 Chestnut St. WATERLOO, IA.

WIRE

electrical, rope, airplane, piano, pipe-organ, flat, hoops, bale-ties, tacks, nails, barbed-wire, concrete re-inforcement, springs, netting, wire fences, steel posts, trolley-road wires and rail bonds, wire wheels, auto-towing cables, horse-shoes.

Illustrated Books Describing Uses, FREE

American Steel & Wire Co. Chicago New York

Bartlett DROP-FORGED Compound Lever Snips $2.40 to $5.50

Used by U. S. Government

Made for hardest service. Highly tempered crucible steel, drop forged. Cuts keen. Holds the edge. Cuts 18-gauge metal at point easily—cutting power three times that of ordinary straight snip. For sale by dealers or sent postpaid in United States at these prices:

7-inch, stamped	$1.80
8-inch, forged	2.40
10-inch, " " "	3.60
12-inch, " " "	4.80
14-inch, " " "	5.50

FOLDER ON REQUEST

BARTLETT MFG. CO., 20 E. Lafayette Ave., Detroit, Mich.

ToolCases for Toolmakers and Machinists

Keep your tools orderly arranged in a Greiner Portable Tool Case. There's a place for every tool in one of the felt lined drawers. Every up-to-date mechanic needs one and you'll find our Cases the best built, neatest and most practical on the market. We guarantee to please or refund all money. Write for circular booklet

A. Greiner & Sons

Mfrs. of Mechanics' High Grade Tool Cases
808 Columbia St., DAYTON, OHIO

EXACTLY LIKE PICTURE

MECHANICALLY RIGHT

Swing 4 in., 11 in. between centers. 17 in. total length. Shipping weight 13 lbs. Bed of lathe is machined. Workmanship first-class. Equipped with wood turning chuck. Can be fitted with 3 in. face plate and drill chuck as special equipment. Order one today. Price $5.00 cash with order. **STYPER MFG. CO., DEPT. D TOLEDO, OHIO**

Chemical Tricks for Boys

You can mystify your friends with puzzling chemical tricks; write secret letters with invisible ink; pour red, white and blue from a glass of water; make your own magic writing paper; your own blue ink or ink powder; write with water and have it turn blue. You can do these and more wonderful tricks with "CHEMCRAFT" Junior—the boys' miniature chemical outfit; complete as shown at left. Send for your outfit right now and get a Free copy of "The Chemcraft Chemist," an interesting magazine for boys.

Amateur Chemist's Catalogue and Hand Book containing much valuable information for Boy Chemists and listing many useful chemicals and apparatus, sent postpaid for 10c. None free. Regular "CHEMCRAFT" Chemical Outfits, $1.50, $3 and $5.

THE PORTER CHEMICAL CO., P. O. Box 51, Hagerstown, Md.

CHEMCRAFT JUNIOR 25¢ POSTPAID

SEND for CATALOG P28

It will be pocket size, 8x4½ and will contain 248 pages with over 1,100 illustrations, describing in plain, clear language all about Bells, Push Buttons, Batteries, Telephone and Telegraph Material, Electric Toys, Burglar and Fire Alarm Contrivances, Electric Call Bells, Electric Alarm Clocks, Medical Batteries, Motor Boat Horns, Electrically Heated Apparatus, Battery Connectors, Switches, Battery Gauges, Wireless Telegraph Instruments, Ignition Supplies, etc.

Send for a copy now.

Manhattan Electrical Supply Company, Inc.

New York, 17 Park Place — St. Louis, 1106 Pine St.
Chicago, 114 So. Wells St. — San Francisco, 604 Mission St.

Build and Fly Model War Aeroplanes!

Study Aeronautics. Learn all about Aeroplanes and how they fly. Build a Model Aeroplane that will fly like a real one. With IDEAL Scale Drawings and Building and Flying Instructions you can easily build exact 3 ft. duplicates of War-famous Aeroplanes. Send now for Drawings and Instructions for the one you want to build.

Curtiss Military Tractor, Bleriot Monoplane, Nieuport Monoplane, Taube Monoplane, Curtiss Flying Boat, Wright Biplane, Cecil Peoli Racer.

25c EACH POSTPAID

Catalogue of IDEAL Model Aeroplanes and Supplies, 5 Cents. None Free.
IDEAL AEROPLANE & SUPPLY CO., 159 Wooster Street, NEW YORK

DUCK'S BIG 300-Page No. 12 Electrical and Wireless CATALOG

Mailed on receipt of 12 cents in stamps or coin, which may be deducted on first dollar purchase. Great cost of catalog and low prices prohibit distribution otherwise. Catalog contains 160 pages of wireless apparatus and 140 pages electrical supplies. No bigger or better values are obtainable elsewhere.

THE WILLIAM B. DUCK CO., 223-227 Superior Street, TOLEDO, OHIO

Do Your PRINTING

Cards, circulars, labels, tags, book, menus, paper. Press $6. Larger $20. Job Press $60, up. Save money. Print for others, BIG PROFITS. All easy, rules sent. Write factory TODAY for press catalog, TYPE, cards, paper. **THE PRESS CO, D-37 MERIDEN, CONN.**

AGENTS 500% PROFIT

Gold and Silver Sign Letters

For store fronts, office windows and glass signs of all kinds. No experience necessary. Anyone can put them on and make money right from the start.

$30.00 to $100.00 a Week!

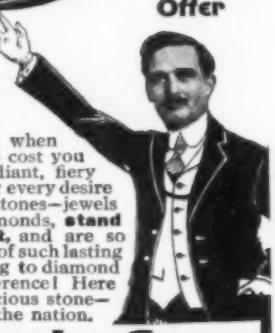
You can sell to nearby trade or travel all over the country. There is a big demand for window lettering in every town. Send for Free Samples and full particulars.

Liberal Offer to General Agents

METALLIC LETTER CO., 433B N. Clark St., Chicago

$25.00 a CARAT

Square Deal Miller's Offer



¼ Carat $10.00
½ Carat $15.00
¾ Carat $20.00
1 Carat $25.00

Why buy diamonds, when for less than 1-20th the cost you can buy jewels of radiant, fiery beauty that will answer every desire you have for precious stones—jewels that are cut like diamonds, **stand every diamond test,** and are so dazzling, brilliant, and of such lasting lustre that it is baffling to diamond buyers to tell the difference! Here is America's own precious stone—the **Thrift Jewel** of the nation.

The Liberty Gem

Set in 14 Karat Solid Gold

LIBERTY GEMS have the wonderful brilliancy, the lasting lustre, the beautiful color that make blue white South African diamonds costing $500 to $600 a carat so valuable. Like Diamonds, a hard steel file will not scratch them. **They cut glass, stand fire and acid;** nothing can mar or mark their wondrous beauty. They are perfect in color, perfect in cut—jewels which in spite of their low cost anyone would be proud to wear. I back these gems with a

$100.00 Forfeit Guarantee

that LIBERTY GEMS are absolutely perfect—in many ways are even better than diamonds, and I will guarantee to pay **$100.00 in cash** to any person who finds a diamond imperfection such as carbon spots, feathers, etc., in LIBERTY GEMS.

Sent On Approval

30 Days' Trial—Easy Credit Terms

To see the LIBERTY GEM you need not send one penny in advance. From catalog select the size and style of mounting. After examination, if you wish to wear the gem, deposit small first payment of Easy Terms. **After wearing 30 full days,** if you decide the LIBERTY GEM is not entirely satisfactory, return it at my expense and your deposit will be instantly refunded.

A Wonderful Book FREE

The story of LIBERTY GEMS reads like fiction, but every word is true. This most interesting story is in a beautiful catalog showing a wonderful assortment of LIBERTY GEMS mounted in the latest and most up-to-date **14 Karat Solid Gold Rings and Jewelry. The book is Free.** Send your name and address—no obligation.

Use this Coupon or Post Card Mail Today

FREE Catalog Coupon

SQUARE-DEAL MILLER, Pres.
MILLER-HOEFER COMPANY
33 State Street Catalog Dept. 29. Detroit, Michigan

Dear Sir:—

Send me, without obligation, Catalog of LIBERTY GEMS—FREE Test offer—introductory direct prices; and Easy Terms.

*Name*_____

*Address*_____

SAVE YOUR BODY

Conserve Your Health and Efficiency First

"I Would Not Part with it for $10,000"

So writes an enthusiastic, grateful customer. "Worth more than a farm," says another. In like manner testify over 100,000 people who have worn it.

The Natural Body Brace

Overcomes WEAKNESS and ORGANIC AILMENTS of WOMEN AND MEN. Develops **erect,** graceful figure.

Brings restful relief, comfort, ability to do things, health and strength.

Wear It 30 Days Free at Our Expense

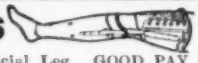
Does away with the strain and pain of standing and walking; replaces and supports misplaced internal organs; reduces enlarged abdomen; straightens and strengthens the back; corrects stooping shoulders; develops lungs, chest and bust; relieves backache, curvatures, nervousness, ruptures, constipation. Comfortable and easy to wear.

Keep Yourself Fit Write today for illustrated booklet, measurement blank, etc., and read our very liberal proposition.

HOWARD C. RASH, Pres. Natural Body Brace Co.
223 Rash Building SALINA, KANSAS

For Boys and Girls Also

Automatic Fibre Limbs



Easy Payments — Do Nature's Work.
AGENTS WANTED who use Artificial Leg. GOOD PAY.
FREE Fibre Sample. DESCRIBE STUMP TO **WORMAN CO.** 322 ANDRUS BLDG., MINNEAPOLIS, MINN.

How to Get Rid of Moles

A simple, safe home treatment—15 years' success in my practice. **Moles** (and other growths) **Dry Up.**

Ask for Free Booklet of Full Particulars.

WM. DAVIS, M.D.
4141 State Street PERTH AMBOY, N. J.

RO-SAN Indoor Closet

Absolutely ODORLESS

Put It Anywhere in the House

The germs are killed by a chemical process in water in the container, which you empty once a month. **Absolutely no odor.** No more trouble to empty than dishwater. **Closet absolutely guaranteed.** Write for full description and price. Eliminates the out-door toilet, open vault and cesspool. They are breeding places for germs. Have a warm, sanitary, odorless toilet right in your house. No going out in cold weather. A boon to invalids. **Endorsed by Clubs, Boards of Health.** W. M. Davis writes: "Your Indoor closet is giving absolute satisfaction. It is certainly the thing for a home without sewerage."

More Comfortable, Healthful and Convenient than the Out-Door Toilet

AGENTS—DEALERS WANTED—ALL COUNTRIES

A wonderful opportunity for wide-awake men. Good margin of profit. Write for special proposition.

ROWE SANITARY MFG. CO.
12606 ROWE BLDG. DETROIT, MICH.
Ask about the Ro-San Washstand — Hot and Cold Running Water Without Plumbing

GET WELL—BE YOUNG—GROW TALL

This University discovery has gained the unqualified approval of the foremost physicians of all schools. It restores the mechanical integrity of the body. Eliminates diseases arising from congestion of blood and lymph, contractured muscles and ligaments, depleted cartilages, impinged nerves. **A cure for old age. It will increase the length of the human body.** THE PANDICULATOR CO., 1514 Prospect Av., CLEVELAND, O.

DEAFNESS IS MISERY

I know because I was Deaf and had **Head Noises** for over 30 years. My invisible Antiseptic Ear Drums restored my hearing and stopped Head Noises, and will do it for you. They are Tiny Megaphones. Cannot be seen when worn. Effective when Deafness is caused by Catarrh or by Perforated, Partially or Wholly Destroyed Natural Drums. Easy to put in, easy to take out. Are "Unseen comforts." Inexpensive. Write for Booklet and **my sworn statement** of how I recovered my hearing.

A. O. LEONARD, Suite 226, 70 5th Avenue, New York City

Don't Wear a Truss

MR. C. E. BROOKS

Brooks' Appliance, the modern scientific invention, the wonderful new discovery that relieves rupture, will be sent on trial. No obnoxious springs or pads.

Brooks' Rupture Appliance

Has automatic Air Cushions. Binds and draws the broken parts together as you would a broken limb. No salves. No lies. Durable, cheap. Sent on trial to prove it. Protected by U. S. patents. Catalog and measure blanks mailed free. Send name and address today.

BROOKS APPLIANCE CO., 126-C State St., Marshall, Mich.

METALLIC LETTER CO., 433B N. Clark St., Chicago

Please Mention Popular Mechanics

will free you of tax on your health and efficiency that pain causes. The pain of headache, neuralgia, indigestion, and colds, should be stopped at once, the Doctors will tell you, because pain is a shock to the nervous system that menaces health. It taxes your endurance and causes dangerous over-fatigue. You should stop it at once. Take wholesome, pleasant Orangeine, a physician's prescription that has been helping millions to efficient, good health by relieving their pain for twenty-five years.

The Physician's Prescription Is On Every Package

so you may "know what you're taking." No opiates. Insist on Orangeine. At druggists anywhere for convenience—and in homes everywhere for emergency. Keep it on hand at all times for quick relief. Tablet or powder form.

Prices Per Package

Powders, 10c—25c Tablets, 15c—25c

ORANGEINE CHEMICAL COMPANY, CHICAGO

(4)

Beautiful face and lovely complexion DO NOT OFFSET AN UNGAINLY FIGURE

Women in every clime strive to preserve or achieve a graceful figure and erect carriage, yet thousands are fighting against fearful odds on account of improperly supporting the vital parts—the abdomen.

Women who realize that style and good health may go hand in hand, should use the Goodform Reducer-Supporter to the exclusion of anything else as assistance in affording that grace of carriage—that beauty of line—that equipoise of bearing—that additional support which corsets and ordinary supporters do not give. The result being, better health, and a consequence, still greater beauty.

Note the picture here produced—illustrating how the Goodform Reducer-Supporter clings closely to the body—observe the marvelously beautiful figure—the correct carriage—the beauty of form, the charming poise, and then you can understand why the Goodform Reducer-Supporter is in such great favor with the ladies.

SUPPORT and PROTECTION afforded in The Newly Patented "GOODFORM" Reducer-Supporter

Free If you use any kind of abdominal protector, or if you should, write at once for **FREE** detailed information, anatomical chart and pictures of this wonderful invention.

FREE INFORMATION COUPON

GOODFORM MFG. CO., 1026 Mills Bldg., St. Louis, Mo.

I require abdominal protection, and wish to know all about your patented GOODFORM. My waist measure is inches.

Name.....

Address.....

STOP USING A TRUSS

Do Away With Steel And Rubber Bands

FREE TRIAL

Inner surface is made adhesive to secure the PLAPAO-PAD firmly to the body, keeping the PLAPAO continually applied and the pad from slipping. No straps, buckles or springs attached. Soft as velvet—easy to apply.

It's the Non-Slipping, yet Non-Rigid Pad and What is Within It That Counts

FREE to 5,000 Truss Sufferers

To the extent of 5,000 sufferers who may apply I will send, ABSOLUTELY FREE, a sufficient quantity of the Plapao to positively convince them that this is the only logical, commonsense way of treating rupture. Plapao is a highly astringent medication placed within the Plapao-Pad and being absorbed through the skin, creates a wonderful feeling of relief and at the same time tends to strengthen the weakened muscles and thus permanently close the rupture opening. The process of recovery is natural, so you'll have no use for a truss—you can throw it away forever! Old and young have testified under oath that the Plapao-Pads cured their rupture—many of them long-standing, aggravated cases—without delay from work. Patent allowed in U. S. and foreign countries. Awarded Gold Medal at Rome and Grand Prix at Paris.

Send No Money—for a sufficient quantity of the Plapao is sent without charge to enable you to give it a thorough test; you pay nothing for this trial now or ever. Write for it and full information today. Address Plapao Laboratories, Block 1427 St. Louis, Mo.

Bowlegged Men

Your legs will appear straight when you wear

Straightleg Garters

Combination hose-supporter and pantleg straightener—**Quickly adjusted to fit various degrees of bowlegs;** as easy to put on and comfortable to wear as any ordinary garter—**no harness or padded forms;** just an ingenious special garter for bowlegged men—improves appearance wonderfully. Wearers are enthusiastic. You will be too. Write for free booklet, mailed in plain envelope.

S-L GARTER COMPANY

726 Trust Co. Bldg. DAYTON, OHIO

FIBRE LEGS ARMS

4-LB. FIBRE LEGS—ON EASY TERMS

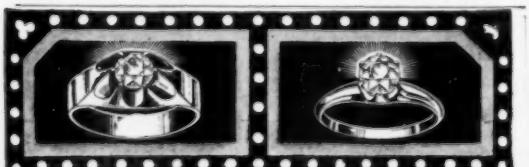
Orthopedic braces for all deformities. Send for booklet.

MINNEAPOLIS ARTIFICIAL LIMB CO., 636 Dean Bldg., MINNEAPOLIS, MINN.

AGENTS $60 WEEKLY

Robinson Folding Bath Tub. Bigseller. Costs little, no plumbing, little water. Weight 15 pounds, folds into small roll. Full length baths, far better than tin tubs. Guaranteed 10 years. $10 a day easily made. Write for free tub offer.

ROBINSON CABINET MFG. CO. 4948 Factories Bldg., Toledo, Ohio



"Finer Than a Diamond"

R. H. G. of Carlisle, Pa., writes: "I like my Lachnite ring better every time I look at it. I think it is finer than a genuine diamond."

Send No Money Just send your name and finger size, we'll send a Lachnite ring, set in solid gold, prepaid, right to your home; when it comes deposit $4.75 with the postman, and wear the ring for ten full days. **If you, or any of your friends can tell it from a diamond, send it back.** If you return the ring in ten days we will return your deposit immediately. But if you decide to keep it, send $2.50 a month until $18.75 has been paid.

Write Today Send your name now. Tell us which of the solid gold rings illustrated above you wish (ladies' or men's). Be sure to send your finger size.

Harold Lachman Co., 12 N. Michigan Ave., A119 Chicago

WRITE TODAY for OUR 168-PAGE *FREE* BOOK on

Deafness

and learn how Perfect Hearing is now being restored in every condition of deafness or defective hearing. Our *"Little Wireless Phones for the Ears"* require no medicine, but effectively replace what is lacking or defective in the natural ear drums. They are simple devices, which the wearer easily fits into the ears, where they are invisible. Soft, safe and comfortable.

WILSON EAR DRUM CO., Incorporated

949 Inter-Southern Bldg. LOUISVILLE, KY.

NO MORE BALD HEADS

WHEN our VACUUM CAP is used a few minutes daily. We accept no pay until you have tried the Cap 60 days and are satisfied. The Vacuum Cap is an appliance that draws the blood to the Hair Roots and starts a new healthy crop of hair. It stops Dandruff, stops the hair from falling out. Bought by Doctors and men who know that it is the only reasonable HAIR GROWER known to science. No Drugs Used. Write for application blank, testimonials, and booklet on "HAIR," sent sealed in plain envelope, FREE.

THE MODERN VACUUM CAP CO.

O. 559 BARCLAY, DENVER, COLO.

Swear Off Tobacco

Tobacco Habit Banished In 48 to 72 Hours

Immediate Results

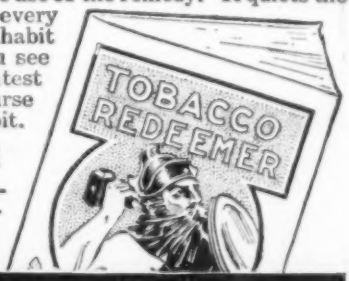
Trying to quit the tobacco habit unaided is a losing fight against heavy odds, and means a serious shock to your nervous system. So don't try it! Make the tobacco habit quit you. It will quit you if you will just take **Tobacco Redeemer** according to directions.

It doesn't make a particle of difference whether you've been a user of tobacco for a single month or 50 years, or how much you use, or in what form you use it. Whether you smoke cigars, cigarettes, pipe, chew plug or fine cut or use snuff—**Tobacco Redeemer** will positively remove all craving for tobacco in any form in from 48 to 72 hours. Your tobacco craving will begin to decrease after the very first dose—there's no long waiting for results.

Tobacco Redeemer contains no habit-forming drugs of any kind and is the most marvelously quick, absolutely scientific and thoroughly reliable remedy for the tobacco habit.

Not a Substitute

Tobacco Redeemer is in no sense a substitute for tobacco, but is a radical, efficient treatment. After finishing the treatment you have absolutely no desire to use tobacco again or to continue the use of the remedy. It quiets the nerves, and will make you feel better in every way. If you really want to quit the tobacco habit—get rid of it so completely that when you see others using it, it will not awaken the slightest desire in you—you should at once begin a course of **Tobacco Redeemer** treatment for the habit.



Results Absolutely Guaranteed

A single trial will convince the most skeptical. Our legal, binding, money-back guarantee goes with each full treatment. If **Tobacco Redeemer** fails to banish the tobacco habit when taken according to the plain and easy directions, your money will be cheerfully refunded upon demand.

Let Us Send You Convincing Proof

If you're a slave of the tobacco habit and want to find a sure, quick way of quitting "for keeps" you owe it to yourself and to your family to mail the coupon below or send your name and address on a postal and receive our free booklet on the deadly effect of tobacco on the human system, and positive proof that **Tobacco Redeemer** will quickly free you from the habit.

Newell Pharmacal Company
Dept. 300 **St. Louis, Mo.**

Free Book Coupon

NEWELL PHARMACAL CO.,
Dept. 300 **St. Louis, Mo.**

Please send, without obligating me in any way, your free booklet regarding the tobacco habit and proof that **Tobacco Redeemer** will positively free me from the tobacco habit.

Name.....

Street and No.....

Town..... State.....

Are You Fit or Fat?

Lose your fat without losing your health and feel good while doing it, by wearing

Professor Charles Munter's

NULIFE ABDO-VIBRO BELT

COMPELS DEEP BREATHING

Feels like rubber, supports like a bandage, does not slide up or down

Reduces the abdomen — **Straightens round shoulders**
Expands the chest — **Supports the back and spine**
Develops the lungs — **Improves the circulation**
Makes you stand, sit, walk and grow erect

NULIFE gives an internal massage with nature's tonic—fresh air

Send us **$3.00** today with your height, weight and waist measurement taken over your undergarments, with your abdomen drawn in and state sex; we will send you our **NULIFE ABDO-VIBRO BELT** by parcel post prepaid and **guarantee it to do all we claim of it or your money will be cheerfully refunded.**

Address Dept. 60, NULIFE COMPANY
122-124 Fifth Ave. New York, N. Y.

Write for booklet "The Benefits of Deep Breathing." Sent free upon request

Agents and representatives wanted in every city; no experience necessary

Agents: $50 a Week

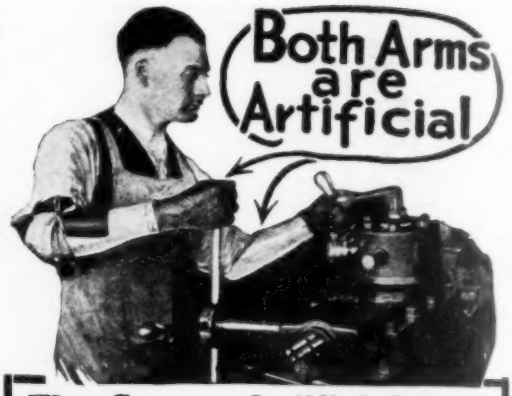
No-Bang Door Check

For screen doors, storm doors, office doors. A prospect for one or more in every home, store, grocery, bakery or office. Stops the bang and saves the door.

KEEPS FLIES OUT OF THE HOUSE

A splendid seller. Easy sales, low priced. Big demand. Any one can put it up. Russell sold 90 in 2 days. Gore sold 123 in one week. Vetter sold 72 in less than three days. Mitchell writes: I think I can sell 600 in this town. Don't miss this big chance. Get started at once. Dozen can be carried. Write for free demonstrating sample.

THOMAS MFG. CO., 3248 Gay St., DAYTON OHIO



The Carnes Artificial Arm

has enabled Edward Finnegan, 413 Olive St., Kansas City, Mo., to continue his work as a skilled mechanic, altho he has lost both arms. His earning power is the same, his efficiency practically as high. To see him work or on the street, you would never think that both arms were artificial. This is because the Carnes Artificial Arms which he wears are inconspicuous, natural in appearance, strong and serviceable.

The Carnes Arm is totally unlike any other. It is the only arm that is practical and useful, and at the same time does not proclaim itself as being artificial. Its wearers are able to continue their ordinary occupations, wait on and care for themselves.

Catalog Free We will cheerfully send you our catalog, which fully explains the Carnes Artificial Arm and shows by actual photographs how Salesmen, Mechanics, Farmers, etc., are able to use it in their regular occupations. Write for a copy today.

CARNES ARTIFICIAL LIMB COMPANY
208 Carnes Bldg., 904 East 12th St., KANSAS CITY, MO.

Make Big Money THIS SUMMER

Here is a good chance, a great opportunity. I have started hundreds of men and women in this high class, profitable business who are now making $25 to $40 a week and more. No experience of any kind is required. I want to show you a way to make big money this summer. Woods made $16 first day. Margaret Emerick made $21 two days. Harris made $9 one hour. Anyone can make money easy, quick, sure—taking orders for "Zanol" Concentrated Soft Drinks and Ciders, for making delicious summer drinks at home. Every popular drink, Orangeade, Lemonade, Cherry, Apple Cider, &c.

In concentrated form—small package—makes 80 glasses. Always ready, any time, just add water. Guaranteed under U. S. Pure Food Laws. Big seller for picnics, parties, fairs, ball games, &c. Big line of 250 other fast selling popular household necessities. I furnish complete Outfit and full instructions. Act quick. Write today for exclusive territory and free trial offer. I will show you how to make money.

ALBERT MILLS, Mgr. Dept. 1251 Cincinnati, O.

"BOW LEGS and KNOCK-KNEES" UNSIGHTLY

SEND FOR BOOKLET SHOWING PHOTOS OF MEN WITH AND WITHOUT THE PERFECT LEG FORMS

PERFECT SALES CO.
140 N. Mayfield Ave., Dept. 3, Chicago, Ill.

DIAMONDS ON CREDIT

Send No Money Any Diamond shipped for inspection, charges prepaid. Examine carefully — if satisfied pay 1/5 and keep it — balance 10% monthly. If unsatisfactory, return, our expense. **DON'T PAY A CENT** unless you're sure Lyon Diamonds are **SUPERIOR VALUE**. Every Diamond guaranteed. Exchangeable at **YEARLY INCREASE** in **VALUE** of 8%. Send **TODAY** for **FREE** Catalog No. 3A. **10% Discount on all Cash Purchases.**

J. M. LYON & CO., 1 Maiden Lane, NEW YORK

AK TABLETS FOR All Pain

Headaches
Neuralgias
Colds and La Grippe

Women's Aches and Ills
Rheumatic and Sciatic Pains

Ask Your Druggist for A-K Tablets
(If he cannot supply you, write us)

Small Size 10c — AK Fac-Simile — **Dozen Size 25c**

See Monogram AK on the Genuine

The Antikamnia Remedy Company, St. Louis, Mo.
Write for Free Samples

Wrestling Book FREE

Learn to be an expert wrestler. Know scientific wrestling, self-defense, and jui-jitsu. Develop a splendid physique, and have perfect health. Join this popular school and learn by mail. The famous world's champions—the marvelous

Frank Gotch and Farmer Burns

offer you a wonderful opportunity. Wrestling is easily and quickly learned at home by mail. Men and boys write now for splendid free book. Learn all the science and tricks. Be able to handle big men with ease. Accept this wonderful offer NOW. Send for free book today, stating your age.

Farmer Burns School of Wrestling, A919 Range Bldg., Omaha, Neb.

Buchstein's Fibre Limb

is soothing to your stump—strong, cool, neat, light. Easy payments. Braces for all deformities.

Send for Catalog Today

D. BUCHSTEIN CO.,
113 6th St. S., MINNEAPOLIS, MINN.

MADE TO YOUR ORDER $1.85 SEND NO MONEY

To Prove Our Fine Quality we offer these fine pants for dress or business, many handsome styles, genuine worsted goods, beautiful narrow weave, smooth silky finish, guaranteed for 2 years solid wear and satisfaction and regular $5.00 value or MONEY BACK. These stylish $5.00 pants, while they last, only one pair to any customer, by prepaid express, for only **$1.85**

Cash Profits You can earn a lot of extra money by sending orders for your relatives and neighbors. Young Grant Case made $27.00 first week and over $500.00 his first year. Get his own book about it Free—also fine tailor book, cloth samples and simple directions. All goes to you Free with first letter. Just send us your name—TODAY.

$1.85 Buys $5.00 Value

CHICAGO TAILORS ASS'N.
Dept. M568-515 S. Franklin St., Chicago

VIOLET RAYS for Health Strength and Beauty

You can now *give yourself* the wonderful Violet Ray Treatment—recognized by science as a most effective health-restoring agent. Heretofore the benefits of the famous Violet Ray were only procurable at big expense from physicians or specialists. It is now simplified and made perfectly safe for self-treatment. See list of treatments on coupon below. Send for full particulars.

Sold On Liberal Trial Plan

Painless Electricity Science has modified electricity that the weakest may stand the force without fear or pain. The Violet Ray High Frequency has no comparison with the old, crude electrical batteries and shocking current. Every jar and shock is removed. The effects are marvelously rapid. Relief can be given in one or more treatments. Often permanent improvements accomplished in that time. To keep or restore your good looks and gain vitality throw away medicine bottles—take this sensible scientific means. Every day's delay makes relief more difficult. **Send for Booklet, "Health via Violet Ray."**

Renulife VIOLET RAY High Frequency Generators

How Violet Ray Benefits Electricity from your light socket is transformed into health and beauty-giving Violet Ray—powerfully effective, yet gentle, soothing, perfectly safe. Voltage is raised from lighting current, giving tremendous penetrative force. The irresistible, re-vitalizing powers of Renulife Violet Ray are carried at once to every nerve cell of the body. Blood is enriched and purified by a flood of oxygen, functions restored to normal—extra supply of fresh blood quickly brought to area treated, removing congestion and supplying nourishment; combines the benefits of electricity, vibration, exercise, stimulation and oxidation.

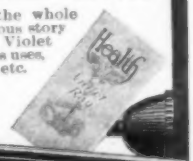
Wanted—Live Representatives

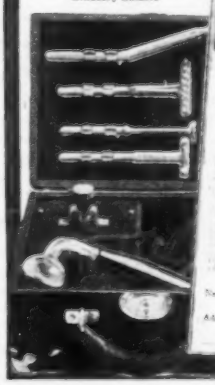
Renulife Electric Co.
652 Marquette Bldg., Detroit, Mich.

Canadian Renulife Electric Co.
252 Netting Bldg.,
Windsor, Ontario

Get Book Sent Free

Get the whole marvelous story of the Violet Ray—its uses, prices, etc.





COUPON FOR BOOK and Special Information

RENULIFE ELECTRIC CO.,
652 Marquette Bldg., Detroit

Please send without obligation, your book "Health," explaining Violet Ray treatments with Renulife Generators, also give full particulars as to its application for ailments checked below.

TREATS SUCCESSFULLY

Abscesses	Facial Neuralgia	Obesity
Anemia	Falling Hair	Pain in Abdomen and Chest
Asthma	Female Complaints	Paralysis
Arteriosclerosis	Goiter	Piles
Baldness	Gout	Pimples
Blackheads	Hemorrhoids	Pyorrhea
Brain Fag	Hay Fever	Rheumatism
Bronchitis	Infantile Paralysis	Scars
Bunions	Insomnia	Sciatica
Boils	Lameness	Skin Diseases
Cataract	Locomotor Ataxia	Sore Throat and Throat Diseases
Colds	Lumbago	Sprains
Childbirth	Nervous Affections	Toothache
Dandruff	Neuralgia	Weak Eyes
Deafness and Ear Diseases	Neuritis	Wrinkles
Eczema		Warts and Moles
Enlarged Prostate		

Name .....

Address .....

H B
16-Battery
Charging
Set

CHARGING AUTO BATTERIES

Will Pay $150 to $250 *Clear Profit* Every Month

All you need is HB Equipment. The business is waiting for you—**right now.** More cars are being driven than ever before, with batteries to recharge, and all new Fords are equipped with storage battery. Start **NOW** to get these big, steady profits.

This H-B 16-Battery Charger Can Be the Biggest Money-Maker in Your Garage

Recharges 1 to 16 6-volt batteries or equivalent in 12- or 24-volt batteries at once. Current cost 12 to 15c each. Owner pays 75c to $1.50. Figure those profits. Compare them with other branches of your business! HB Chargers last for years—sturdy, economical, dependable. Finest materials and construction. Long service with *quick, clean, permanent profits.*

$57 Puts This Money-Maker in Your Garage on Money-Back Guarantee

Balance in 10 monthly payments of $23 each. Earnings pay for machine. No electrical knowledge necessary to install or operate. Uses 2 or 3 phase city current. Furnished complete with 2 charging panels capable of charging 1 to 8 batteries each. No burn-outs or expensive renewals. Nothing to wear out or break. Sold on HB Absolute Money-Back Guarantee. Order now—you run no risk. Pin your $57 check to this ad and mail **today** for trial order.

Hobart Brothers Company, Box M6, Troy, Ohio
Successful Manufacturers Since 1893

Short One Point—and the Other Keeps on Firing!

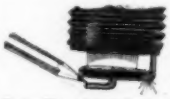
Ordinary troubles don't stop the Twin Fire plug because it has two distinct sparks—each operating entirely independent of the other, just as if you had two separate plugs in each cylinder.

TWIN FIRE

Means Two Distinct Sparks!

If you short one point by means of an ordinary lead pencil (see illustration) the other goes right ahead firing and the hot explosions soon clean the first one—putting it back in working order again.

Ordinary plug dead when even one point clogs.



Twin Fire always fires. Clog one gap and the other still fires. One point cleans the other.

Ask your dealer to see the famous "Lead Pencil" Test.

Dealers

The Twin Fire is the only plug with two independent sparks—and with the Twin Fire Demonstration Outfit sales come easily and fast. Get details on dealer plan at once

Twin Fire Spark Plug Co.
724 Grand River Ave., Detroit, Mich.

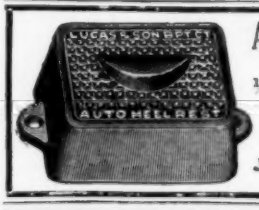
MOTORIST AGENTS WANTED

Everywhere to sell High-Grade 5800-Mile Tires direct from factory. New stock. (No seconds.) All sizes. Delivered FREE on approval. ACT AS AGENT—GET YOUR OWN

TIRES FOR ¼ LESS

Represent us in your locality. Be quick—write today—give size of tires.

Walter David Rubber Company, 208 Sweeney Bldg., Kansas City, Mo.



Auto Heel Rests

MADE IN 4 SIZES

½" 1" 1½" 2"

of Frosted Aluminum

Sold by all Dealers, or will be sent postpaid 75c. Made only by

J. L. LUCAS & SON, Inc.
Bridgeport, Conn.

1919 Columbia Bicycles

Send for Catalog

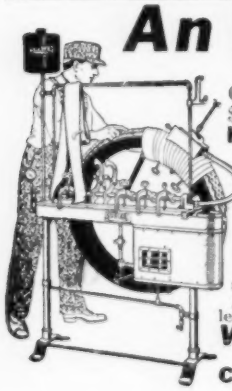
Westfield Mfg. Co.
Dept. 15, WESTFIELD, MASS.

BUELL EXPLOSION WHISTLE

Now used by over 40 Automobile Mfrs. as standard or optional equipment. Quickly attached, simple to operate, never needs adjustment. **Guaranteed** for 10 years. Single tone $4.25. Chime $6.00.

SEND FOR CIRCULARS

Buell Manufacturing Co., 2983-85 Cottage Grove Ave., Chicago



An Easy Way to Make Money

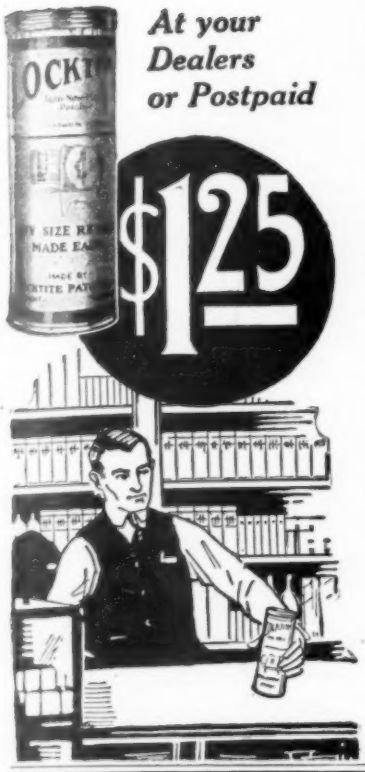
Don't be content to plod along on a small salary. Be independent. Go in the tire repairing business and make $60 or more a week. One man made $45 the first day he received his outfit. **Others are making $25 a day and hundreds of wide-awake men are making $200 to $500 a month.** No experience needed. We teach you how. Very little capital required. But slight risk, as every car owner in your town is a possible customer. Jobs are plentiful because tires blow out and puncture every day.

SHALER *Tire Repair Outfit, $70*

will do as much and as perfect work as the big $250 to $500 vulcanizing outfits. A boy can vulcanize perfectly with this simple machine. It's the only vulcanizer that has **Automatic Heat Control.** It must vulcanize just right. It can't undercure or overcure a tire. Requires no watching or regulating. You can learn to do expert tire vulcanizing in half an hour with the Shaler.

WRITE FOR FREE BOOK "HOW TO OPEN A TIRE REPAIR SHOP" and complete Catalog, which gives full information. WRITE QUICK BEFORE SOME HUSTLER GETS AHEAD OF YOU.

C. A. SHALER CO., 2005 Fourth Street, WAUPUN, WIS.



Locks the Patch to the Tube

BECAUSE it seals a rip or hole in a tube absolutely tight—in a jiffy—with no waiting for the patch to set—

Because it is a complete tube repairing patcher—with cylinder and clamp for holding tube in place—with emery—with strong, Locktite, canvas-back patchingsheet—gasoline swab—tube buffer and cement—

That's why the Locktite Auto-New-Matic Patcher is in great demand by all motorists.

Blowouts or punctures—any size repair is made easy with the Locktite.

HOW IT WORKS

First place the tube around the container—as shown in the picture. Clean and roughen the surface around the hole with emery, apply cement. Then press on the patch firmly—and the tube is ready to go into casing. No waiting for the patch to set.

Save time and money by securing a Locktite Patcher at once. Then you will be ready for any emergency on the road—and can repair your spare tubes in your own garage. Be ready, for tire trouble is bound to occur.

Send money direct if your dealer is unable to supply you with the Locktite. The price for this new Locktite Auto-New-Matic Patcher is $1.25. If you order by mail we will pay the postage. It is sold on a money-back guarantee.

LOCKTITE PATCH COMPANY, DETROIT, MICH.
1027 BELLEVUE AVE.
Canadian Plant: **Windsor, Ontario**

LOCKTITE
AUTO-NEW-MATIC PATCHER

The Anderson Steam Vulcanizers

WE MANUFACTURE THEM
We Own and Teach You the Anderson Method of Vulcanizing

90% Profit And still you guarantee your work to outlast balance of the tire and collect full customary prices. Ask us for literature and location of nearest Anderson State School. We urge you visit that city where you can see all other makes and learn their method, then visit the Anderson School there and learn our Method. Go prepared to take 5 to 10 days' course of the ANDERSON METHOD. We guarantee to make a first class vulcanizer out of you or refund your money. Our course will cost you $20 in either the day or night classes and any time thereafter you buy and pay us for a vulcanizer, your $20 will be refunded in cash. $235 and 5 to 10 days in any Anderson State School of Vulcanizing will start you in this most profitable business.

The ANDERSON STEAM VULCANIZER CO.
2 Williams Bldg., INDIANAPOLIS, INDIANA, U. S. A.
Please print your name. We receive many we cannot make out.

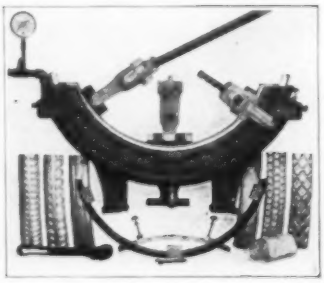
THE CORBIN DUPLEX COASTER BRAKE
is the standard brake equipment, assuring absolute control. Equip it now. Send for 1919 catalog.
THE CORBIN SCREW CORP. The American Hardware Corporation, Successor
NEW BRITAIN, CONN. BRANCHES, New York, Chicago, Philadelphia

Any Tire You Want at Wholesale Cost. No Seconds or Off-Brands — All Guaranteed New Stock. We Pay the War Tax.

Buy direct from one of largest tire jobbers in America—we have no agents, salesmen, no hotel, traveling or salary expenses. You get the saving. No matter what tire you want (Goodyear, Goodrich, Firestone, Capitol, etc., guaranteed up to 6000 miles), we can save you money. We legally guarantee every tire. Write today for prices.

A. H. Jennings & Sons, 1614 N. 7th St., Kansas City, Kans.

Anti-Skid Retreading at Enormous Profits and Small Investment



Free Instruction in Tire Repairing at our Plant.

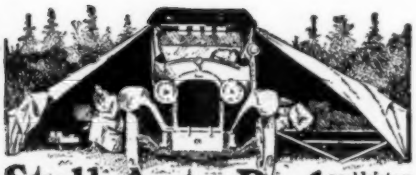
Dry Cure Retreading

is the most PROFITABLE and INTERESTING occupation of the entire automobile industry and we have so simplified the process with our latest machines that the average person can produce perfect non-skid tires with less than a week's instruction.

Write today and let us tell you about this greatest mechanical achievement in the history of vulcanizing equipment. A tire retreading machine which not only forms and cures plain and ribbed treads, but will produce beautiful designs in various anti-skid patterns.

We also manufacture Steam Generators, Section Molds, Tube Plates and General Tire Shop Equipment. Get our Catalogue and Prices before Buying.

WESTERN TIRE & RUBBER WORKS
315-323 No. Crawford Ave., Chicago, Ill.



Stoll Auto Bed and Water Proof Tent

Comfortable-Convenient-Compact

Goodbye to stuffy rooms at hold-up rates. Stop when and where you please, yet sleep as comfortably as at home, with a Stoll Auto Bed. It folds up on the running board into a bundle 6½ x 8 x 47 inches, with bedding complete. Does not block doors. Nothing to crowd tonneau.

Camp Comfort Supreme

Simple, compact, practical and mechanically perfect. Includes Spring-Mattress-Bed large enough for two—tent of army shelter-duck, ventilated with screen windows. Lasts for years. Quickly pays for itself in hotel bills saved. Write for illustrated booklet and prices.

Established Dealers: *Write for our unusually attractive proposition.*

The Stoll Mfg. Co.
3233 Walnut St. Denver, Colo.

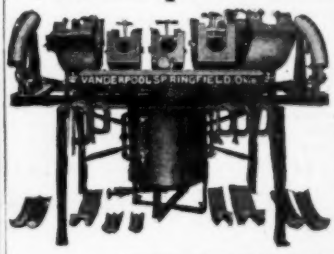
The Opportunity is Tremendous

Hundreds of thousands of new automobiles being sold every year.

Open a Tire Repairing Shop

Most profitable business on earth requiring such small investment. In a short time you build up an enormous business.

Vanderpool Vulcanizer

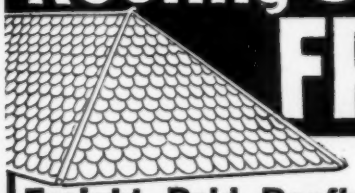


repairs tires exactly as made at the factory. Capacity of $100 worth of work a day. Vanderpool Vulcanizer has improved features not possessed by any other. Write at once for **Free Tire Repairing Manual** and full particulars.

In answering address Dept. B9.

WILLIAM VANDERPOOL CO.
SPRINGFIELD, OHIO

Roofing Book FREE



Get Our Freight Paid Roofing Prices

Don't buy Roofing of any kind until you get our big Free Roofing Book, describing full line of Edwards Famous "Tightcote" Galvanized Roofings, Sidings and Ceilings, and our lowest freight-paid prices. Then see for yourself how much we save you by selling direct and saving you all in-between dealers' profits.

EDWARDS "REO" Metal Shingles

Absolutely rust proof. By our patented "Tightcote" process, edges as well as sides of metal sheets are heavily coated with zinc—not a space the size of a pin point exposed to weather. Fire and lightning proof. Outlasts three ordinary roofs. Forever wind and weather proof. Need no repairs—end all roofing expense. Patent **INTERLOCKING DEVICE** makes water tight seams—all nail heads covered—no chance for rust or leaks.

EDWARDS Galvanizing Test

Edwards "Tightcote" Galvanized Roofing can be bent, twisted or struck by lightning, and the galvanizing will not crack or flake. Bend it or hammer it—you can't loosen or scale the galvanizing. No other galvanized roofing can withstand this test.

Low Priced Garages

Wide variety of styles, all sizes of Portable Fireproof, Metal Garages. Lowest prices ever made. Postal brings Big Garage Catalog **free.**

Write Today for free samples and proof that we can save you a lot of money on any kind of roofing, siding or ceiling you may need. Ask for Roofing Book No. 650

THE EDWARDS MFG. CO.,
600 - 650 Pike St., Cincinnati, O.

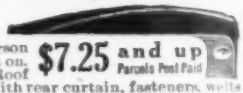
The Liberty Plane Radiator Ornament

The most popular Radiator Ornament ever produced. Fits any car, indestructible, solid aluminum, highly polished, wings hand-painted with flying emblem in Red, White and Blue. The slightest motion spins Propeller arm, and makes it seem alive. "It fairly hums with Patriotism." Postpaid $1.00; get the Agency.

DEFENDER AUTO LOCK COMPANY
500 Marquette Bldg. Detroit, Michigan

You Can Save $50.00

By recovering your old auto top frame yourself. We make these recovers to fit all makes and models of cars. Any person that can drive a car can put it on. We furnish instructions. Roof and quarters sewed together with rear curtain, fasteners, welts and tacks. All complete. Give us the name, year and model number of your car and we will send you our catalogue with samples and quote you exact price.



$7.25 and up Parcels Post Paid

LIBERTY TOP & TIRE CO., Dept. E7, Cincinnati, O.

GREB RIM TOOL

Operates all types of cross-split rims "Wallop" your rim with a hammer to force it in or out of place and you are bound to have greater trouble next time. **DO THE SENSIBLE THING:** Provide yourself with the best rim tool on the market and save time, trouble and rims.

Ten Days' Trial If your dealer or jobber does not have them, we will send you one. Try it ten days. If not satisfactory, return it to us and we will refund your money. **We also make the Greb Automatic Grip Puller.**

THE GREB CO., 193 State St., BOSTON

Tire Agent

We want one exclusive representative in each locality to use and sell the new Mellinger Extra-Ply, hand made tires. **Guarantee Bond for 6000 Miles.** (No seconds.) Shipped prepaid on approval. Sample sections furnished. Do not buy until you get our Special Factory Prices. Write

MELLINGER TIRE & RUBBER CO., 946 Oak St., Kansas City, Mo.

Build Your Ford into a Classy Speedster with the Red-I-Kut Life-Sized Patterns

Your own tools and spare minutes are all that's needed.

3 types
$3.50
$5.00
$6.00
Send stamp for catalogue to
KUEMPEL CO.
Guttenberg, Ia.

They Just CAN'T Miss!
Price $1.25 Each. 30 DAY OFFER 4 For $3.00
PRIMO Transformers
increase the spark immensely. Make starting easy Explode all the vapor. More Power—Less Fuel. Will last 2 years. Money-back guarantee.
THEY JUST *CAN'T* MISS!
WESTERN IGNITION CO.
Dept. F, 618 Frisco Bldg. ST. LOUIS, MO.

35 Miles per hour
Is Record of this Car

Boys, Build This Car. This nifty little car driven by gasoline motor, can be built by any boy. Parts are furnished by us and are very cheap. Send 25c for building plans & price list of parts showing how to build this lad 'scar.
SYPHER MFG. CO.
146 Warren Street
TOLEDO, OHIO

$40 Motorcycle
We have the largest line of new and used motorcycles in the country at the lowest prices. Every machine guaranteed. Send for catalog. We are the largest and only exclusive motorcycle supply house in the world. Repairs a Specialty. Send us your machine to be overhauled. Motors and castings for airships and railway velocipedes. WE EXCHANGE MOTORCYCLES.
HARRY R. GEER CO., 888 McLaran Ave., St. Louis, Mo.

INSYDE TYRES Inner Armor
for Auto Tires. Double mileage, prevent blowouts and punctures. Easily applied in any tire. Thousands sold. Details free. Agents wanted.
Amer. Accessories Co., Dept. PD Cincinnati

CUSHION COMFORT FOR ALL CARS
From a Ford to a Pierce Arrow. None So Good or Bad We Can't Improve.
Write for Full Particulars and Price.
American Cushion & Spring Co.
Factory 5 KALAMAZOO, MICH.

$1 a Week pays for the Black Beauty

Send No Money
Shipped on Approval Freight Prepaid

Don't buy an ordinary bicycle. Get the **Black Beauty**—*factory direct; wholesale price.* Magnificent wheel Strongest, raciest in all cycledom. *Five-year guarantee.*

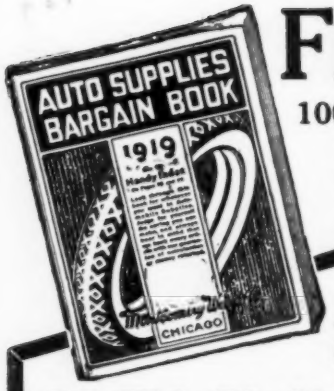
18 Exclusive Features

See the wheel before paying a cent. Get our Catalog; select your model. *20 Styles.* We ship at our own risk. Keep or return. No waiting to save up money. *Months* to pay—small amount on acceptance, then $1 a week.

Sundries Get our factory prices first. Lowest in the country. Tires, lamps, horns, etc. Everything for cyclists. Free Sundries Catalog.

Haverford Cycle Co. Dept. F 63 PHILADELPHIA

FREE Beautiful New Catalog in colors



FREE

100-Page Book

Low Prices

Auto Owners:

Get This Big New Book

Sit in an easy chair at home and buy auto supplies from this Guide to Low Prices. Over 2000 selections to choose from. It shows supplies that will improve all cars—and make them worth more—gas savers, spark plugs, batteries, spot light, painting outfits, touring outfits, etc.

Reduced Prices on Riverside 5000-Mile Auto Tires

Riverside Tires are now priced the lowest they have been in months. This new FREE book tells all about them—the prices prove Riverside Tires give you "Most for the Money." Write now for your FREE copy of this book. Address the house nearest you.

Dept. C133 **Montgomery Ward Co.**

Satisfaction Guaranteed or Your Money Back

Chicago Kansas City Fort Worth Portland, Ore.

Coast Up Hill

The **Johnson Motor Wheel** makes any bicycle into a ***two*** cylinder motorcycle—strong enough for any man, light enough for women and children. Travels 6 to 35 miles an hour. 150 miles on a gallon of gasoline. Magneto and electric light generator.

No special clothing required for riding any more than for a bicycle. Same guarantee as for the most expensive motorcycle.

Don't Push —Just Coast

Two Cylinders

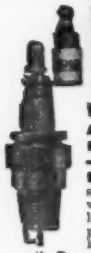
Electric Light Generator

$80

Johnson Motor Wheel on an ordinary bicycle

Write for catalog and name of nearest dealer.

JOHNSON MOTOR WHEEL CO.
209 S. LA SALLE ST., CHICAGO, ILL.



EMO TRANSFORMERS

Will Increase Power—Add Fuel Mileage—For Automobiles, Aeroplanes, Trucks, Tractors, Motorcycles, Marine and Stationary Engines

EMO TRANSFORMERS transform the ordinary slow, faint spark into a high-tension blue blaze or flame which instantly explodes all the vapors even in the lowest gravity fuel, thereby insuring greatly added power and mileage. This intensive blue-white EMO flash keeps the spark plug points free from carbon, soot and oil. Prevents "bucking" or "loping." Insures easy starting, quicker acceleration, and a steady uniform flow of power at all speeds. Protects the entire ignition system. Save many times their cost in fuel and spark plug economy. One EMO on each plug makes all cylinders pull even. Can be attached by anyone.

$1.00 Each at Dealers, or sent prepaid upon receipt of price. State make of car when ordering.

The Emo Laboratories 2255 North Illinois St. INDIANAPOLIS, IND.

DENINGER WILL SAVE

BIG MONEY SAVINGS FOR YOU

$40

Used and rebuilt motorcycles, single and twins, $25 to $100. - Used bicycles, $5.00; tandems, $10. All machines guaranteed in good working order. New bicycles and motorcycles at Factory prices. You save dealers' profits. Motorcycle and automobile tires too, $3.00. Complete line of parts and supplies.

Send for catalog

Deninger Cycle Co., Rochester, N.Y.

YOU 25 TO 50 DOLLARS

BUILD THIS CAR OR BUY IT COMPLETE

Lowest Priced Car in the World!

Very fast. Economical. Seats two full-grown persons. Not a toy. **Complete Detailed Drawings, 35c.** Catalog 10c. Cycle Car and Light Car parts at low prices. Discount to Agents.

Tribune Engineering Co., Dept. P Owego, Tioga Co., N. Y.

The Cleveland

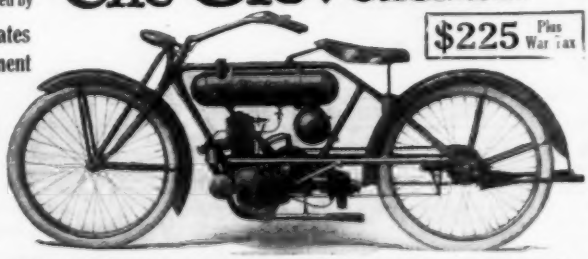
75 MILES for the gallon

The only lightweight motorcycle adopted by The United States War Department

Two Stroke Motor Unit Power Plant Worm Drive Transmission Standard for four years

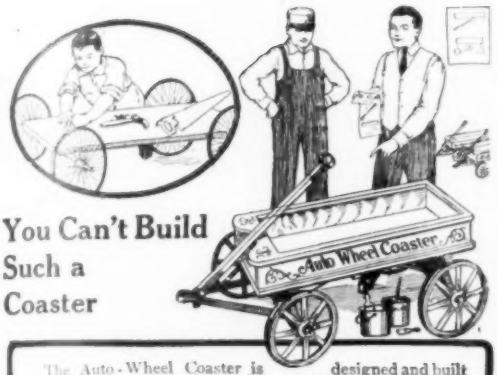
Write for catalog and agency. (One dealer sold six carloads last summer.)

$225 Plus War Tax



BLENDING light weight with low cost, the CLEVELAND still has no rival among motorcycles. It stands alone in its scientific combination of light weight and power. The 1919 CLEVELAND is retaining the same principles of original design that have made it successful for four years—but this year's model is a finer machine than ever before—in appearance, comfort and service.

THE CLEVELAND MOTORCYCLE MFG. CO., Cleveland, U. S. A.



You Can't Build Such a Coaster

The Auto-Wheel Coaster is designed and built by men who know boys' tastes, and have the materials to build with. For years a favorite because of its strength, speed and grace.

The Auto-Wheel Convertible Roadster below is a double purpose wagon, changed in a minute from roadster to speedster. Both types have the durable oval spokes, roller-bearings, and steel axles.

Free Felt Pennant and Color Catalog for names of 3 coaster wagon dealers. (Tell which handles the Auto-Wheel).

Caps Free to Auto-Wheel Coaster Club members. Special cap to captain. Organize your Club now, and write for details.

THE BUFFALO SLED COMPANY
137 Schenck Street N. Tonawanda, N. Y.
In Canada: Preston, Ont.

2 WAGONS IN 1

KENNEBEC CANOES

The "tumble home" of the Kennebec makes this canoe absolutely safe for man, woman and child. Our 1919 catalog, sent free for the asking, tells why.

KENNEBEC Kennebec Boat & Canoe Co.
69 R. R. Square, Waterville, Maine

KIMBALL CORD TYPE TIRES

GUARANTEED 3500 MILES

NOTE OUR PRICES

Size	Tires	Tubes
30 x 3	$11.00	$2.50
30 x 3½	13.25	2.60
32 x 3½	15.25	2.70
31 x 4	18.25	2.80
33 x 4	21.50	3.50
34 x 4	22.50	3.60

Other sizes in proportion. *Terms:* $1 deposit with each tire ordered, balance C. O. D. subject to inspection.

KIMBALL TIRE & RUBBER CO., INC.
2204-PM Michigan Ave. CHICAGO, ILL.

DUNN COUNTERBALANCES for Ford Crankshafts

are the greatest accessory yet produced. Attached by removing plate on bottom of crankcase. Not necessary to remove shaft from motor. Fifteen high-priced cars now use counterbalanced crankshafts. Dunn Counterbalances produce the same results in a Ford. No machine work necessary. Installed in an hour. Over ten thousand in use, and every user satisfied. Try a set ten days and if they do not do all we claim return them and money will be refunded. Guaranteed to save 20% gasoline, reduce vibration to a minimum, relieve bearing pressures and add 100% to the life of the motor. All Ford racers are being equipped with them. They put the Ford motor on par with Multi-cylinder and super-motors. Price $12.00 per set. Cash or C. O. D. or write for full information.

DUNN COUNTERBALANCE CO., Box P, Clarinda, Iowa

Thrifty?-yes:

LONG-LIFE
Kokomo
BICYCLE TIRES

THE longer your tires last the less they have cost you. Kokomos have more rubber, have a leak-proof valve liner made from one piece of cured rubber, and an inner lining that never "slow-leaks"—only new, live rubber is used and it can't leak.

The studded tread prevents costly accidents and enables you to speed on slippery pavement.

Kokomos cost less per mile of tire.

Your dealer has five models at low prices. Put on your pair of Kokomos today.

Kokomo Rubber Company
Kokomo, Indiana

TIRES QUALITY AND ECONOMY FOR MOTORISTS

Slightly used and factory repaired tires and new tubes of the best known standard makes that mean big cash savings for every car owner. No junk is included in this stock.

Size	Tires	New Tubes	Size	Tires	New Tubes
30x3	$5.00	$1.70	36x4	$ 9.00	$3.00
30x3½	6.00	2.10	34x4½	9.25	3.15
32x3½	6.50	2.25	35x4½	9.50	3.25
31x4	7.25	2.50	36x4½	9.75	3.30
32x4	8.00	2.60	37x4½	10.25	3.50
33x4	8.75	2.70	35x5	10.50	3.65
34x4	8.75	2.80	36x5	10.50	3.65
35x4	9.00	2.90	37x5	11.00	3.75

Special Proposition to Live Dealers

For Non-Skids add 10 per cent to Above Prices

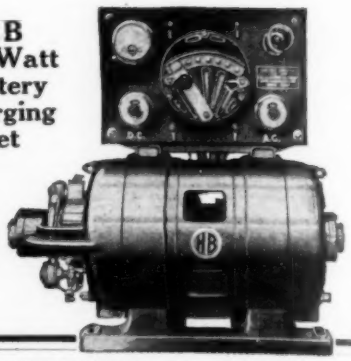
Complete Stock of New Tires

Write for Prices Terms: $1.00 deposit with each tire ordered, balance C. O. D. subject to inspection. Specify style of rim to avoid delay. Although at the above prices these tires bear no mileage guarantee we will make reasonable adjustments should they prove unsatisfactory. All tires sent in for adjustment must be prepaid.

TIRE REPAIR & SUPPLY COMPANY
DEPT. P. 1429 MICHIGAN AV.
CHICAGO

TUBES

HB 500 Watt Battery Charging Set



RIGHT NOW You Can Make Big Profits in

BATTERY CHARGING

Owners of HB Chargers everywhere are making $100 to $400 *Clear Profit* every month, depending upon size of HB Charger they have. Business better than ever—no end in sight. **YOU** can do as well. Don't delay—this business is at your door. Get out and get it with sturdy, dependable HB Equipment.

This HB 500 Watt Charger Will Pay $100 to $200 Clear Profit Each Month

No electrical knowledge required to install or operate. Recharges 7 6-volt batteries at once. Costs 12c to 15c each to recharge, customer pays 75c to $1.50. Big, quick, clean profits—easily made. No burn-outs or expensive renewals. Steady service 24 hours a day. Economical to run, requires no attention save occasional oiling.

$25 Puts This Money-Maker in Your Garage on Money-Back Guarantee

Balance in 9 monthly payments of $20 each. Earnings easily pay for machine. Pin $25 initial payment payment check to this ad and send *today* for trial order. Sold under HB Absolute Money-Back Guarantee. Order **NOW.** Don't delay. Get busy! Get those profits!

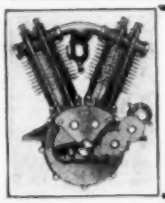
Hobart Brothers Company, Box M6, Troy, Ohio

Successful Manufacturers Since 1893

No **Punctures** **Essenkay** A TIRE FILLER No **Blowouts**

Write for Confidential Free Trial Introductory Offer on ESSENKAY for passenger car or truck tires. OVER 50,000 SATISFIED USERS!

ESSENKAY PRODUCTS CO., 68-220 W. Superior, Chicago



12 to 15 H.P. Motor, $55

complete with carburetor and unisparker

Just the thing for aircraft, cyclecars, motor sleds, railroad speeders, etc. Can also be supplied with cooling fan for stationary purposes. A lightweight, high speed, high efficiency valve-in-head motor, weighing 85 lbs., which has made good in actual service. Order from this advertisement. We guarantee motor as represented. Circular "A" mailed on receipt of stamp.

Lake Motor Co., Box 630, Milwaukee, Wis.

Unreel Your Spotlight!

High-powered windshield searchlight—instantly converted into trouble light. Two twists of the thumb and finger—withdraw lamp to any part of your car. 12 feet of cord on a reel—winds and rewinds like a window shade.

Autoreelite

A Touring car necessity! Fits any car. Spotlight, trouble light, portable light—all in one self-contained lamp.

PRICES
(Black Enamel, Nickel Trim)

6-inch size, 20 c. p. $9 **7-inch size, 32 c. p. $10**

All-nickel sport model $15

Ask your dealer. Write for Booklet **PM207.**

ANDERSON ELECTRIC SPECIALTY CO.
118-124 S. Clinton Street, Chicago, Ill.

FREE NEW BOOK

NEW STYLES LOW PRICES

Wonderful improvements in frame designs. New curved top bar models with truss forks. **Our Streamline Motobike is the leader of all bicycles for 1919.** Even the children's models have curved top bars, extension handle bars and stands.

HAWTHORNE BICYCLES

GUARANTEED LARGE SELECTIONS TO CHOOSE FROM

Styles, sizes and colors to please everyone. A full line of boys' and men's models, also ladies' and children's models. Remember this—every **Hawthorne Bicycle** is guaranteed to give satisfaction or your money refunded.

Tires, Electric Lights, Horns, in fact, everything you need to put your old bike in shape are also shown in our new **Bicycle Book.** Majestic Puncture-Resisting Tires, low priced. We save you money on supplies, too. **Write now for this Free Book.**

Montgomery Ward & Co.
Satisfaction Guaranteed or Your Money Back

Dept. G133

Chicago Kansas City Fort Worth Portland, Ore.

Save $6.50

Why pay $7.00 for a new pair of bicycle tires when you can get much more wear out of the old tires by treating each with a 25c tube of old, reliable

NEVERLEAK
TIRE FLUID

Try it! you may get another season's wear out of your old tires because Neverleak stops all leaks and preserves the rubber, keeping the tires air tight.

Simply inject contents of tube through valve stem, that's all. At all dealers, 25c a tube.

Buffalo Specialty Co.
Buffalo, N. Y.

No More Spark Plug Troubles

Any old plug made to fire perfectly—even after porcelain is broken. One of the greatest inventions yet discovered for automobiles.

"Sure-Fire"
Spark Intensifiers

Makes a fast, hot spark that will explode entire charge in cylinder. That helps to burn up all excess oil, keeps cylinder free from carbon and insures a smooth, easy running engine. Puts lots of "pep" into the spark. Increases voltage and makes spark jump unfailingly. Makes cars start quicker and snappier in cold weather.

Spark always in sight—easy to detect and locate broken wire, short circuits, etc. Quickly and easily attached to any screw terminal plug. Thousands in use—Customers are Boosters.

Dealers—WANTED—Agents

Liberal terms and discounts to live dealers. Excellent proposition for hustlers in exclusive territory. Anyone can sell the Sure Fire Spark Intensifier. Once demonstrated, quickly sold. Sent by mail, postpaid, on receipt of price: four for $2.00, six for $2.75, eight for $3.50 or twelve for $5.00.

Satisfaction Guaranteed or Money Back—Write Today

Motor Economy Company Box 705 (P) Cincinnati, Ohio

Quality Above All—Price Comes Next

Slightly Used and Factory Repaired **TIRES and TUBES**

SIZE	TIRES	NEW TUBES	SIZE	TIRES	NEW TUBES	SIZE	TIRES	NEW TUBES
30x3	$4.50	$1.95	33x4	$8.50	$3.25	35x4½	$9.25	$4.25
30x3½	5.50	2.30	34x4	8.50	3.40	36x4½	9.50	4.40
32x3½	6.00	2.40	36x4	8.75	3.65	37x4½	10.00	4.50
32x4	7.75	3.05	34x4½	9.00	4.15	37x5	10.75	4.75

$1.00 deposit with each tire. Tires will be sent promptly C.O.D., privilege of examination. Specify style of rim to avoid delay. If tires do not give service in proportion to the price paid, reasonable adjustment will be cheerfully made providing tires are returned to us by prepaid express.

LINCOLN TIRE & SUPPLY CO., 1463 S. Michigan Ave., Dept. P, CHICAGO, ILL.

FUN

Noiseless Target Practice

Fit your .22 with a Maxim Silencer and get no end of fun this summer practicing in your backyard and on your vacation.

MAXIM SILENCER
MAKES YOU A BETTER MARKSMAN

It eliminates recoil and all noise of the report, and steadies your aim. Direct from Dealer or Factory, $5.00. Write for Free Book of Stories.

FREE BOOK

Maxim Silencer Co., 93 Homestead Ave., HARTFORD, CONN.

The Seneca Motor Car

Built for the Owner **$990.00**

Simple, sturdy construction. Low cost of up-keep and operation. Cantilever springs in rear. Comfortable, easy-riding.

4-cyl.—27 H.P.
108 in. wheel base

Dealers Wanted

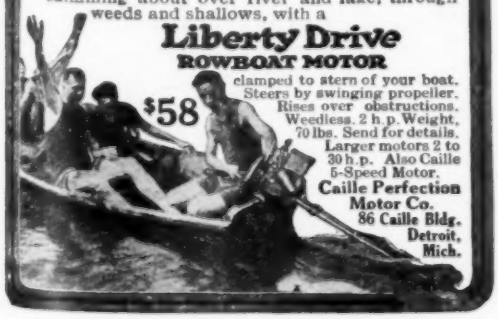
Immediate deliveries. Fifth successful year. Increased output. Liberal newspaper advertising in dealers' territory. Wonderful opportunities. Write or Wire NOW

THE SENECA MOTORCAR CO., 26 Seneca Factory, FOSTORIA, OHIO

IT'S REAL SPORT

—skimming about over river and lake, through weeds and shallows, with a

Liberty Drive
ROWBOAT MOTOR



$58

clamped to stern of your boat. Steers by swinging propeller. Rises over obstructions. Weedless. 2 h.p. Weight, 70 lbs. Send for details. Larger motors 2 to 30 h.p. Also Caille 5-Speed Motor.

Caille Perfection Motor Co.
86 Caille Bldg.
Detroit, Mich.

PROTECTO EXPLOSION AUTOMOBILE WHISTLE

Eliminates Accidents
Prevents Car Thefts

Used by leading manufacturers as standard equipment. **Quickly attached** to any car in **2 minutes time** (no wiring, wrench only tool required), it can be set to whistle the moment car is started. As a safety device the driver has a **life line** at his hand continually. Simple to operate. Musical tone and clear blast. Never needs adjustment. Sold on **money back** guarantee. Specify name of car when ordering.

For cars with overhead valves and not equipped with Priming Cups

Dealers—Agents—Garagemen
This is a winner. WRITE TODAY.

MARVEL CO., 140 S. Wabash Ave., Dept. 2, CHICAGO

$2.50 Complete

PATENTS

IF YOU HAVE AN INVENTION which you wish to patent you can write fully and freely to Munn & Co. for advice in regard to the best way of obtaining protection. Please send sketches or a model of your invention and a description of the device, explaining its operation.

All communications are strictly confidential. Our vast practice, extending over a period of seventy years, enables us in many cases to advise in regard to patentability without any expense to the client. Our Hand-Book on Patents is sent free on request. This explains our methods, terms, etc., in regard to **Patents, Trade Marks, Foreign Patents, etc.**

If you are a reader of the

SCIENTIFIC AMERICAN

you are probably aware of the fact that it has a special appeal to the inventor. Each issue contains a description of a large number of recently patented inventions. Pending patent legislation as well as the most recent rulings of the Patent Office and the courts are considered in its columns.

MUNN & CO.

SOLICITORS OF PATENTS

672 Woolworth Bldg., NEW YORK

and

627 F Street, WASHINGTON, D. C.

Please Mention Popular Mechanics

PATENTS *and* Trade Marks

Send sketch or model for actual search and report. Write for Booklet of instructions on patent practice and procedure. Prompt personal service. . . .

Geo. P. Kimmel

Patent Lawyer

53U Loan & Trust Bldg., Washington, D.C.

PATENTS

C. L. PARKER
Formerly Member Examining Corps, U. S. Patent Office
PATENT LAWYER
McGILL BLDG.
WASHINGTON, D. C.

Patents, Trade Marks, Copyrights, Patent Litigation

Handbook for Inventors, "**Protecting, Exploiting and Selling Inventions,**" sent free upon request.

INVENTORS AND INVENTIONS

Have You an Idea ?

A book published by H. Robinson, Lindenhurst, N. Y., indispensable and interesting to every inventor. Treats authoritatively in clear, popular and entertaining style the following subjects: How to Invent and Make Drawings. Financing and Marketing a New Invention. Advice to Inventors. The Glory of Invention. Pictures of Famous Inventors. Various Ways Employed to Cheat and Rob Inventors. Available Means of Protecting an Invention. Treatment the World Accords to Them and Other Important Subjects. Profusely illus., cloth bound, $1. Cash or money order. H. ROBINSON, LINDENHURST, L. I., N. Y.

PATENTS

LACEY & LACEY

Attorneys-at-Law—Patent Practice Exclusively

Solicitors of

U. S. and Foreign Patents

Trade-Marks, Copyrights

641 F Street, N.W., Washington, D. C.

Write Us for Our Free Inventors' Book

PATENT-SENSE.

ESTABLISHED 1869

PATENTS TRADE-MARKS AND COPYRIGHTS

Before disclosing an invention, the inventor should write for our blank form **"Evidence of Conception."** This should be signed and witnessed and if returned to us together with model or sketch and description of the invention, we will give our opinion as to its patentable nature.

Our Illustrated GUIDE BOOK **HOW TO OBTAIN A PATENT** Sent FREE on Request

Contains full instructions regarding Patents, Trade-Marks, Foreign Patents. Our Methods, Terms, and 100 Mechanical Movements illustrated and described, Articles on Patent Practice and Procedure, and Law Points for inventors.

Highest References — Prompt Attention — Reasonable Terms

FREE COUPON!

VICTOR J. EVANS & CO., Patent Attorneys

New York Offices 1007 Woolworth Bldg. | Philadelphia Offices 135 S. Broad St. | Pittsburgh Offices 514 Empire Bldg.

Main Offices: 765 9th St., N. W., WASHINGTON, D. C.

GENTLEMEN: Please send me FREE OF CHARGE your BOOK as described above.

NAME..... ADDRESS.....

PATENTS PROCURED and TRADE-MARKS REGISTERED

Eighteen Years' Experience. Instructions and Terms on request

ROBB & ROBB, *Attorneys-at-Law*

811 Southern Bldg., Washington, D. C. 1332 Schofield Bldg., Cleveland, Ohio

PATENT YOUR IDEAS

Safe, proper handling of your business. Reasonable, easy pay.

H. L. WOODWARD, Attorney, 9th & G Sts., WASHINGTON, D. C.

Experimental Work — Light Manufacturing

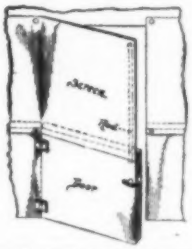
Metal Stampings and Instrument Work

Tools, Dies and Fixtures *Service and Reliability*

WM. A. ZEIDLER CO., 401-425 E. 163rd St., NEW YORK CITY

Reward of $100.00

for purpose of anticipating a patent, for first sufficient proof of use in the United States before 1906, or of an adequate description or illustration in a printed publication anywhere before 1906, of a door, preferably a vehicle door, having above it a screen, or any other flexible material such as canvas, fastened at one side beyond the door hinge and at the other side supported on a rod or similar removable part carried by the door opposite the hinge, so that the screen swings with the door and covers an opening above the door. Example shown, but structure need not be just like it. Further particulars furnished on application.



GEORGE M. DOWE
Room 1900, 2 Rector St.
New York City

PATENTS If You Have an Invention and Desire to Learn How to Secure a Patent

Send for our Guide Book, **HOW TO GET A PATENT**, sent Free on request. Tells our terms, methods, etc. Send model or sketch and description of your invention and we will give our opinion as to its patentable nature.

RANDOLPH & CO.

600 F St., N.W., Washington, D.C.

NAME.....

STREET.....

CITY..... STATE.....

PATENTS

Booklet Free **Highest References** **Promptness Assured** **Best Results**

Send drawing or model for preliminary examination

ALL BUSINESS GIVEN PROMPT AND PROPER ATTENTION.

WATSON E. COLEMAN, Patent Lawyer, 624 F St., Washington, D. C.

PATENTS

To the Man with an Idea

I offer a comprehensive, experienced, efficient service for his prompt, legal protection and the development of his proposition.

Send sketch, or model and description, for advice as to cost, search through prior United States patents, etc. Preliminary advice gladly furnished without charge.

My experience and familiarity with various arts, frequently enable me to accurately advise clients as to probable patentability before they go to any expense.

Booklet of valuable information and form for properly disclosing your idea, free on request. Write today.

Richard B. Owen, Patent Lawyer
9-303 Owen Building, Washington, D. C.
2276-E Woolworth Bldg., New York City

Can You

think of a simple, practical idea that will fill one of the many requests we have on file for new inventions? It may mean a fortune for you. Thousands of things are needed **right now. Your** brains can help. Send today for our great new book—

"Inventions and Trade-Marks, Their Protection and Exploitation"

and learn more about making money from ideas than you ever knew before. It tells many things that are wanted, too.

A postal will do—It is free

We Help Our Clients

without charge, to get the dollars out of their ideas—having facilities none others possess. Advice free. Don't delay—get the book at once.

American Industries, Inc.
200 Patent Dept.
WASHINGTON, D. C.

Patents Advertised For Sale Free

in Invention and Manufacturing Supplement

Published for the man with an idea. Send for free sample copy. One year's subscription, 50c.

PATENTS AND TRADE MARKS

LANCASTER & ALLWINE

204 OURAY BLDG., WASHINGTON, D. C.

Do Not Lose Your Rights to PATENT PROTECTION

Before disclosing your invention to anyone send for blank form "Evidence of Conception" to be signed and witnessed. Establish your rights before filing application for patent. As registered patent attorneys we represent hundreds of inventors all over the U. S. and Canada in the advancement of their inventions. Terms reasonable. The form "Evidence of Conception," sample, instructions relating to obtaining of patent and fee schedule sent upon request. Ask for them—a postcard will do.

PROTECT YOUR RIGHTS

TO INVENTION

Write today for "RECORD OF INVENTION" which contains forms to establish evidence of conception. Prompt personal service. Preliminary advice without charge.

J. REANEY KELLY
723 Woodward Bldg. Washington, D. C.

PATENTS

Send Us a Sketch or Model and explanation of your invention for our opinion concerning its patentable nature and exact cost of applying for patent. Our book **"HOW TO OBTAIN A PATENT" Sent FREE on Request** It tells how to apply for Patents, Trade-Marks, Foreign Patents, Copyrights, etc.; gives information on Patent Procedure; tells what every inventor should know. **Thousands of Inventors,** who are our clients, are our reference.

CHANDLEE & CHANDLEE, 25 Years' Experience. 408 7th St., WASHINGTON, D. C.

PATENTS

INVENTORS

Before applying for a patent you should send us a sketch or model of your invention, and a description of it, and receive our "Evidence of Conception" form—our Opinion as to the Patentable Nature of Your Invention, and our advice regarding the best way of obtaining patent protection. Our practical experience covers a period of twenty years. Our Handbook on Patents

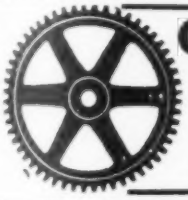
HOW to OBTAIN a PATENT

SENT FREE

is a storehouse of valuable information and advice to inventors. All communications strictly confidential. **Write us TODAY.**

TALBERT & TALBERT
Patent Lawyers

4749 Talbert Bldg., WASHINGTON, D. C.



GEARS ALL KINDS SMALL

The most accurate made and prices reasonable. We carry a complete line of gears in stock for immediate shipment. Can also quote on special gears of all kinds. Send us your inquiries.

WRITE FOR CATALOGUE.

CHICAGO STOCK GEAR WORKS
16 S. Wells St. CHICAGO

MECHANICAL SUPPLIES AND MATERIAL of all kinds.
EXPERIMENTAL AND LIGHT MACHINE WORK to order.
132 MILK STREET. BOSTON

Raise Belgian Hares for Us

Wonderful profits easily made at home. We furnish stock and pay you $6 a pair and express charges. Also cavies and squabs. Beautiful illustrated catalog and contract FREE.

UNITED FOOD & FUR ASSOCIATION
329 W. 48th St. Desk 2 New York

POULTRY—RABBITS
MONEY IN BOTH
Poultry Advocate 50c year
Our Great Rabbit Book 25c
Paper one year and book 65c

POULTRY ADVOCATE, Dept. A-8, SYRACUSE, N.Y.

Health? Take Turkish Bath at Home—Only 2 Cents

Physicians are abandoning drugs for this new treatment. If your mind or body is tired, open your pores and feel the rapid change in your condition, at cost of 2c a bath. **The Robinson Bath Cabinet** is the only scientifically constructed bath cabinet ever made for the home. **Great $2 Book Sent Free**—"The Philosophy of Health and Beauty." Write today. Agents Wanted.

ROBINSON MFG. CO.
984 No. 12th St. TOLEDO, O.

19 Jewel

ADJUSTED
—To Positions
—To Temperature
—To Isochronism

$2.50 A MONTH

—16 Size Thin Model —25 Year Gold Case
—Solid Gold Settings —Double Roller

Send No Money!

Ask For It On Approval

You don't risk a cent. If you send your name and address now (postal will do), we will place this superb 19 Jewel in your own hands for free examination. You will then know that it is the kind of a Watch you want—a real Watch of Railroad quality. Now is the time to own one at our Special low price and easy terms, and to prove all we say, we will send it on

30 Days Free Trial

You take absolutely no chances. Our Special Price is rock-bottom. We guarantee to refund your money if you can beat it for spot cash. Our 20 years experience and large volume of business enables us to make this remarkable offer to wage earners everywhere and throw in our easy terms for good measure. But this Special Offer will not last always. The price may go up. The factory guarantees it will not go down. So write today for our

FREE Catalog and full information on this Big Special Offer. Remember, we sell all kinds of Watches and Diamonds on easy payments **but if you want this superb 19 Jewel at this month's bargain price, act now.**

Dept. 364
HARRIS-GOAR CO. KANSAS CITY, MO.
We Do As We Advertise

RAISE RABBITS

in back-yard. New Zealand Red, Flemish Giant and Belgian Hares Pay five to ten times better than chickens. Breed every month in the year, six to 12 to a litter. Easy to raise. We sell high-grade stock and buy all you raise from same at $7.00 a Pair. 32-page book on housing, breeding and feeding, 4 cents. Write for it TODAY.

DAVIS & SON, 128 Ave. 31, LOS ANGELES, CAL.

NOW TIME TO START
BIG DEMAND. HIGH PRICES BEING PAID

An uncrowded occupation. Exceptional opportunities for live men and women. Raised at home. Only small space needed. Small expenditure will start you in a practical money-making enterprise. Big profits. Booklet telling all free. Write.

Nat'l Spawn Co., Dept. 12, Brighton, Mass.

Raise Rabbits LARGE PROFITS Quickly Made

We supply stock and show you where to market all you raise for $3 to $25 each. Get our beautiful illustrated book, **"Common Sense Rabbit Raising"** it's **FREE**

THE OUTDOOR ENTERPRISE CO., Suite 115, Eighth & Walnut Sts., Kansas City, Mo.

Direct from the Maker to YOU by Mail

$5 Genuine French Brier Pipes

FITTED WITH GOLD PLATED BAND & PATENTED HOLDER

$3.00

Buy your pipes **direct from the maker by mail and save the retailer's profits.** In the panel on the left we illustrate six popular styles of HAMILTON pipes. **Our factory price for them is $3.00.** They are made of **genuine** French Brier, with **heavy gold-plated bands** and hard rubber stems. Each pipe is fitted with our patented invisible stand which, when opened, prevents ashes from spilling. (See illustration below). We guarantee these pipes to meet with your highest expectations—to be the equal of any $5 pipes offered anywhere—or money refunded. **Order by Number.** Enclose $3 with your order and we will ship to you at once, all charges prepaid. **Order NOW.**

HAMILTON PIPE WORKS
Dept. 116
18-20 Sackett St. BROOKLYN, N. Y.

We want every man who shaves to write us for particulars about the Vibrating Electric Razor. No matter where you live, in the city or on the farm, the Electric Safety Razor will solve your shaving troubles.

Vibrating Electric Razor Co., Dept. 132, Omaha, Neb.

Get This Book BEFORE BUYING A TYPEWRITER

We Save You Money

Amazing Values ALL MAKES

Tremendous saving on all standard makes—Remington, Underwood, Royal or any other STANDARD MAKE of machine, according to model. Why pay the higher prices? Get the same value for about one-third manufacturers' prices *and keep the saving in your pocket.* Every machine rebuilt by the famous "Young Process", fully guaranteed and sold on a

Ten-Day Trial Offer IRON-CLAD GUARANTEE

which permits of a thorough TEN-DAY TRIAL. See it, inspect it, USE IT all you wish for ten days. If not satisfied, return it at our expense. If you keep it you are fully protected by our iron-clad guarantee.

Cash, Installments or Rent

Our prices and terms will suit you. You can buy outright for low cash, on small monthly installments, or rent by the month. Rental applies on purchase price if you decide to keep machine.

Send for our FREE BOOK, "The Truth about Typewriters," and Free Catalog—DO IT NOW. Remember every machine is guaranteed to satisfy you.

Young Typewriter Co. Dept. 872 Chicago, Ill.

RUNS ON KEROSENE

Alcohol or Gas Anywhere

A most remarkable invention. No electricity, wires or springs. 1919 Improved patented Models. Runs 8 hours for a cent on kerosene. Quiet—Convenient. Brings genuine comfort and satisfaction. Ideal for the sick. A proved success. 5th season. Every home and office needs the Wonder Fan. Three Models. Three Sizes. **BE WELL, KEEP COOL.** Address **LAKE BREEZE MOTOR,** 566 W. Monroe St., CHICAGO

"Best" Hand Lantern

A powerful portable lamp, giving a 300 candle power pure white light. Just what the farmer, dairyman, stockman, etc., needs. Safe—Reliable—Economical—Absolutely Rain, Storm and Bug proof. Burns either gasoline or kerosene. Light in weight. Agents wanted. Big Profits. Write for Catalog.

ADOPTED BY THE U. S. GOVERNMENT

The Best Light Co., 324 E. 5th St., Canton, O.

Stop that Pain with Violet-Rays

Magic Relief For

Asthma
Constipation
Headache
Rheumatism
Neuritis
Neuralgia
Pimples
Blackheads
Dandruff
Etc.

Violet-Ray treatments now in your own home for less than one cent each! Treat yourself! Starting relief for ailments of blood, nerves and bones. Clear your complexion and purify the scalp. Tone up the entire system. Work, eat and sleep better than you ever have before.

10 DAYS FREE

Try the wonderful Violetta Violet-Ray Machine 10 days free! Mail coupon now for free trial offer and free booklet on the Violetta and all its wonders. Write today for the free booklet.

Not a Vibrator No Shock No Pain

Bleadon-Dun Co., Dept. 26
11 S. Desplaines St., CHICAGO, ILL.

"I Saved $100.00 On My Diamond"

A customer in Seattle, Wash., writes us: "The $85 diamond received from you compares favorably to a ring recently bought at $185." (A saving of $100). N.R—, full name on request.

How to Save on Diamonds

This nearly ¾ century old, diamond banking house, rated over $1,000,000.00, lends money on high grade jewels. We have an extremely large number of diamonds to offer greatly under market prices. We send to you, absolutely free on approval to have valued by any expert you wish. Then try to match for 60% more, that's our challenge.

Why Pay Full Prices

Saved Half on Rings

"The $69 and $75 rings received from you I could not duplicate for double your price and I could sell them for more than I paid you." R. C—, Marion, Indiana.

$105.00 Extra Value

"You have a life customer in me. My $45 cluster ring is valued here at $150.00." M. H. B—, Ardmore, Okla.

Saved Me $40.00

"The $35 diamond ring is a beauty. Could not match it here for less than $75.00." A. D—, Iron Mountain, Mich.

Saved $87.00 on $162.00 Ring

"The stone I bought of you for $75 I could not duplicate for less than $162.00. I am delighted." F. L—, Hope, Ark.

Full names on request

Send for Latest List

See Our Unpaid Loan Diamond Bargains

Send for our wonderful list and bulletins of amazing bargains. Radically different from any regular catalog. You can't realize the bargains until you see for yourself. Every jewel accurately described in detail and you have the opportunity free to verify everything. Write for these marvelous lists of diamond bargains — sent free — no obligations. Our guaranteed loans like insurance policies—ask about them.

Jos. DeRoy & Sons, 1951 DeRoy Bldg.
Only Opposite Post Office **Pittsburgh, Pa.**

References: Dun's or Bradstreet's, Marine National Bank, Pittsburgh, Pa.; Union Trust Company, Pittsburgh, Pa.

Jos. DeRoy & Sons, 1951 DeRoy Bldg.
Only Opposite Post Office, Pittsburgh, Pa.

Gentlemen:—Please send me, absolutely free and prepaid, your new Bargain Bulletin of diamonds, watches and other jewelry. It is distinctly understood that I assume no obligation of any kind.

Name.....

Address.....

.....

Enormous Profits

START GROWING MUSHROOMS

Learn the latest authoritative way to make still bigger profits than you ever thought possible or ever made growing mushrooms. Add **$10 to $75 a week to your income.** Anyone, men, women and children can do it in spare time in city or country. Grow in basements, cellars, sheds, boxes, etc. Start now. Demand bigger than supply. Send for big **free** book of expert authority, "The Truth About Mushrooms." Write to

BUREAU OF MUSHROOM INDUSTRY
Dept. 556 5005 W. North Ave. Chicago

Erickson Artificial Limb Co., 38 Wash. Av. N., Minneapolis, Minn.

We are Under Govt. Bond

Build Your Own PHONOGRAPH

It's Easy With Our Help

A few hours' interesting work saves many dollars and gives you a machine exactly to suit your ideals. We furnish motors, tone arms, case material, blue prints and full instructions. Plays any record. You can make fine profit building phonographs for your friends.

Write Today for Our Free Blue Print Offer

Agents wanted for our ready-built phonographs

CHORALEON PHONOGRAPH CO.
206 Monger Bldg., Elkhart, Ind.

SAVE OVER HALF

WANTED — Railway Mail Clerks

Men 18 to 35
$1100 to $2000 Year
Common Education Sufficient
Sure Pay. Life Job. Pull Unnecessary.

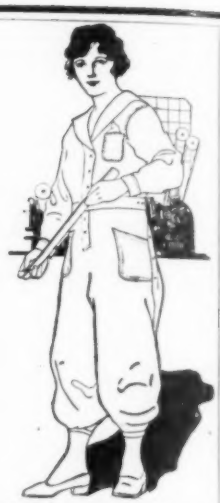
COUPON

Franklin Institute
Dept. F96, Rochester, N. Y.

Sirs: Send me, without charge, (1) sample Railway Mail Clerk Examination questions; (2) schedule showing places of all U. S. Government coming examinations; (3) list of other government jobs now open, and (4) free book describing them.

NAME.....

ADDRESS.....



Have you ever worn a FINCK Combination Union Suit?

If not, buy one at your nearest dealer. If he cannot supply you, send your breast and leg inseam measurement and your dealer's name, and a suit will be sent to your dealer for you—returnable if not satisfactory. We will also mail you a catalog. You will be pleased, like 2,000,000 other wearers, with the fit, comfort, convenience and long wear it gives. For mechanics, farmers and farm women, railroad men, motorists, men and women factory workers.

The coolest work-garment for summer wear

W. M. FINCK & COMPANY, Detroit, Mich.

BRANCHES: St. Louis; Dallas; San Francisco; Seattle; Livingston, Mont.

Many of the devices illustrated in this magazine are operated by

Fractional Horse Power Motors

We are specialists in designing and building such Motors for all purposes. Write for further information.

Holtzer-Cabot Electric Co. BOSTON, MASS.

Help Keep America Free of German Toys

Start Making UmakeM Toys ANYWHERE

Send $10 for this complete toy making shop outfit in large wooden box including following UmakeM tools: 10 in. Scroll Saw, 36 Blades, Rule, 9 in. Hand Saw, Plane, Claw Hammer, Bradawl, Screw Driver, Marking Gauge, Square, Pliers, Sand Paper Block, together with 3 ply wood and all hardware with designs, blueprints and everything needed to make one complete circus outfit including circus wagon and animal wagon, each drawn by large jointed Mules with Clown riders; also everything for making 19 Jointed Circus Animals and other circus figures of $10.75 total retail value. The entire outfit costs less than the value of the first set of toys. Send $2 for outfit including saw with 12 blades, tools, designs, and with enough 3 ply wood and hardware to make 12 Jointed Wild Animals worth 25c each. Send $1 for tools and complete outfit to make seven smaller jointed animals. Send $1 for outfit to make 2 large action toys, one worth $1, the other 25c. Send $10 for chest with tools, blueprints, and directions to make aeroplanes, including all material for one complete Bleriot Model plane that will fly when properly made and which retails made up complete at $18. Send $3 for tools, materials, designs, mechanical parts, etc., to make a $1.25 action toy and 3 50c action toys. Send $2 for complete outfit with tools, patterns, hardware, 3 ply wood and materials to make Tumbling Tim Donkey, with clown rider (worth $1 made up) and 59 smaller items including birds, animals, the alphabet and the numbers. NOTE.—Any Public School official may order any UmakeM outfits to be paid for after receipt in 30 days. Likewise any responsible merchant may so order, as well as any hospital engaged in re-educating soldiers and civilians, any Y. M. C. A., Y. M. H. A., Boy Scouts or other established clubs or any responsible established society desiring to start UmakeM community shops to take the place of saloons. Individuals purchasing UmakeM outfits cash with order may return goods for credit or for money back within five days for any reason or without any reason. Address

W. R. PRICE, General Manager, UmakeM
100 UmakeM Building 127 5th Ave., NEW YORK

NOT TOYS, BUT REAL APPARATUS

The same as used by operating companies. You had better send your order immediately to insure prompt delivery, as this equipment will not last long at these prices.

110-Volt Hand Generators, 3 bars, each		$3.00
" " " " 4 bars, each		4.00
" " " " 5 or 6 bars, each		5.00
Telephone transmitters with arms, each	Postpaid	.85
Good ringers complete with bells, each	Postpaid	.60
Telephone receivers, each	Postpaid	.85
Condensers, ½ to 2 M. F., each	Postpaid	.60
Induction coils, each	Postpaid	.60
Relays, each	Postpaid	1.60
Repeating coils, each	Postpaid	2.10
Real Complete C. B. Wall type Telephones		4.50
Slightly used dry cells, per dozen		1.25

Please send money-order, check or cash with order

ELECTRICAL SPECIALTY COMPANY
Dept. M, 48-50 So. Front St., Columbus, Ohio
Dept. M, 128 So. 11th St., Philadelphia, Pa.

USED BY U. S. AND ALLIED GOVERNMENTS IN WAR

FOR USE IN THE HOME, GARAGE OR SHOP.

25c PER TUBE

TORCH $1

A PASTE THAT TURNS INTO METAL WHEN HEATED

A match will do it. Requires no acid or soldering iron. Joins or repairs wires, metals, or metalware. Sold by hardware and electrical stores, or sent by us postpaid.

SOLDERALL CO., Dept. 3,
129 Sussex Ave., Newark, N. J.

COMBINATION SET Tube and Torch complete **$1.25**

DEAF?

"I Now Hear Clearly"

You, Too, Can Hear!

Inasmuch as 125,000 users of the "ACOUSTICON" have had the same satisfactory results as are apparent in the photograph above, we feel perfectly safe in urging every person who is hard of hearing, without a penny of expense, solely and entirely at our risk, to accept the

1919 Acousticon
For 10 Days' FREE TRIAL

NO DEPOSIT — NO EXPENSE

Since the perfecting of our new 1919 "ACOUSTICON," it is smaller, better and just as strong as ever.

All you need do is to write saying that you are hard of hearing and will try the "ACOUSTICON." The trial will not cost you one cent, for we even pay delivery charges.

WARNING! **There is no good reason why everyone should not make as liberal a trial offer as we do, so do not send money for any instrument for the deaf until you have tried it.**

The "ACOUSTICON" has improvements and patented features which cannot be duplicated, so no matter what you have tried in the past, send for your free trial of the "ACOUSTICON" today and convince yourself—you alone to decide. Address

Dictograph Products Corporation
Successors to The General Acoustic Co.
1307 Candler Building, New York
Canadian Address: 621 New Birks Building, Montreal

$500 REWARD

We will pay $500.00 reward to anyone who can permanently dim the brilliancy of the RAJAH im. diamond without destroying the stone.

RAJAH Im. Diamonds

They stand all diamond tests—fire, acid, file and glass cutting. Their brilliancy is eternal. Guaranteed for a lifetime. Set in solid gold and sent to you on **30 Days' Free Trial** If you can tell it from a real diamond return it. Send today for our beautiful FREE illustrated jewelry catalog in colors. Write now.
KRAUTH & REED, 159 N. State St., Dept. P2, Chicago, Ill.

$2.49 PANTS
Made to Order
Send No Cash

2 YEARS GUARANTEE NO EXTRA CHARGES

Just to prove our low prices—worth $5.50 finely tailored to measure pants, for dress or work. Guaranteed for two years wear or money back. **Good pants can't be sold for less.**

All extras free, pick the style to suit your taste. Peg tops, fancy cuffs, belt loops and pocket flaps, large and stout sizes, not one cent extra.

WE PAY POSTAGE —AND— EXPRESS

Lowest prices in U. S. and we pay postage and express. Write for finest **free** outfit, over 120 styles and genuine cloth samples. We save you $6 to $9 sure.

EARN $35 PER WEEK

Many of our agents earn more. The **Free Outfit** shows you how to earn big **CASH Profits,** write for it now. Send no cash.

SPENCER MEAD CO., Wholesale Tailors, Dept. 150, CHICAGO

Please Mention Popular Mechanics

Are YOU a FREAK?

You've seen them often at the bathing beaches, skinny and flabby, stoop-shouldered, lop-sided, all their physical imperfections displayed in bathing suits. No wonder ridicule follows them, whenever they take off the clothes that make them look like men. *How about YOU*—when you put on a bathing suit? Have you the upright carriage, evenly developed muscles and clear, glowing skin that indicate health, vigor, *MANHOOD?* Don't be a caricature. Even if you are sickly, weak and puny, you can get rid of your ailments and overcome your weakness *if you go about it the right way.*

STRONGFORTISM
WILL MAKE A MAN OF YOU

STRONGFORT
The Perfect Man

Knowledge of *Nature's way* back to restored health and strength is all you need and Strongfortism is Nature's way. There's no mystery about it; no drugs, nostrums or quack remedies. Don't think you are too old to benefit by it; there's no reason why you should be ashamed to take off your clothes simply because you have reached middle life. Strongfortism will free you from your ailments, strengthen your vital organs, give you a symmetrically developed figure and take years off your apparent age. Strongfortism has done it for thousands and is doing it now daily, and *it will do the same for YOU.* No matter what your present condition and whatever brought you to it, Strongfortism will make a new man of you—improve you 100 per cent—and I *guarantee* it, if you will follow my directions for a considerable short time.

SEND FOR MY FREE BOOK

"Promotion and Conservation of Health, Strength and Mental Energy" will give you the essence and guiding principles of Strongfortism, in which I have embodied the results of a lifetime's study and practical experience. It will show you how to build yourself up into a strong, healthy man, free from hampering ailments and imperfections and enable you to make a real success in life. You'd willingly give many dollars for that book, if you knew what it would do for you. Don't miss the chance—SEND FOR IT NOW. IT'S FREE, enclose three 2c stamps to cover postage and packing and I will mail you a copy at once.

LIONEL STRONGFORT
Physical and Health Specialist
953 Strongfort Institute **NEWARK, N. J.**

CUT OUT AND MAIL THIS COUPON

Mr. Lionel Strongfort, Newark, N. J.

Dear Strongfort:—Please send me your book, **"Promotion and Conservation of Health, Strength and Mental Energy,"** for postage of which I enclose three 2c stamps to cover mailing expenses. I have marked (X) before the subject in which I am interested. (9531)

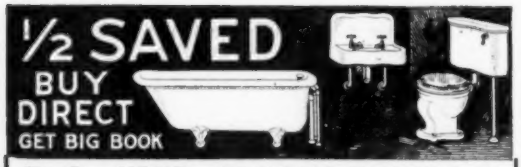
....Colds	....Insomnia	....Weaknesses
....Catarrh	....Short Wind	....Gastritis
....Asthma	....Flat Feet	....Heartweakness
....Obesity	....Stomach Disorders	....Poor Circulation
....Headache	....Constipation	....Skin Disorders
....Thinness	....Biliousness	....Despondency
....Rupture	....Torpid Liver	....Round Shoulders
....Lumbago	....Indigestion	....Lung Troubles
....Neuritis	....Nervousness	....Increased Height
....Neuralgia	....Poor Memory	....Stoop Shoulders
....Flat Chest	....Rheumatism	....Muscular Development
....Deformity (describe)	....Bad Habits	

NAME .....

AGE ..... OCCUPATION .....

STREET .....

CITY ..... STATE .....



DO YOUR OWN PLUMBING & HEATING AT LOW COST

Send for our big instructive 256 page well-bound Handy-Man Book Catalog. Every Home Owner, Contractor, Electrician, Farmer, Factory Manager, etc., needs it. Shows over 10,000 Fixtures and Supplies in plumbing and heating at wholesale. Shows how to save skilled labor, hard work and unnecessary material by

OUR NEW **Cut-To-Fit Method**

This wonderful book helps you select and install the proper Plumbing, Water Supply System, Hot Air, Water or Steam Plant. Besides being our Wholesale Catalog it has many practical plans, diagrams, sketches, elevations, etc., showing how to do the work this newer, cut-to-fit way. Any handy man with a few tools can easily do his own installing with the aid of this

Big Handy-Man Book

We have spared no effort and have gone to a great expense to compile this valuable book. With economy still a national necessity, it would be unpatriotic to send this expensive book broadcast to non-interested parties. Therefore, we request a temporary deposit for each copy of 25c which we refund on first order, or we send our **Bargain Bulletin Free.** Address Today

Hardin-Lavin Company
40 Years at
4547-57K Cottage Grove Ave.
CHICAGO
$500,000 plants behind our guarantee

Electric Light at Home, $1

The latest electric light discovery. No batteries to buy or electric bills to pay. Thousands of homes and farms have installed this electric light years ago and are still using it daily. Guaranteed to be safe, simple and inexpensive; anyone can install it. This midget electric light complete with wiring instructions and high grade material, such as fine copper wire, fibre covered wire holders, single pole knife switch, drop light fixture, battery protector, socket, friction tape, maroon finished shade and globe; also our famous battery compound which will supply the current for the electric lights; also re-charging cables and instructions for re-charging your batteries without expense. These instructions and materials will enable you to have electric light anywhere. **Postpaid for $1.00**

A. B. ELECTRIC CO., 1303 So. Peoria St., CHICAGO

MOTOR REPAIR BOOK FREE

Why spend dollars for repairs when *cents* will do? Write for this *free* book and learn how SMOOTH-ON IRON CEMENT No. 1 (50c a lb. at Hardware and Auto Supply stores) will save you money.

SMOOTH-ON MFG. CO.
Jersey City, N. J., U. S. A.

SMOOTH-ON IRON CEMENT No. 1
For Motor and Household Repairs

DIAMONDS ON CREDIT
10 MONTHS TO PAY

Send No Money!

See the Diamond first! We'll send it, all charges prepaid, without any expense to you. If you like it, pay only 1/5 the purchase price and the rest in 10 monthly installments.

SWEET DIAMONDS proclaim their superiority to all others. Blue-white in color—perfect in cut—low in price—they stand unrivalled. Mounted in graceful, artistic settings of the very newest designs and of excellent workmanship.

OUR PROFIT-SHARING PLAN enables you to exchange your Diamond for a larger gem, allowing you the full purchase price, plus 7½% increase in value. We share our profits with you.

Our FREE Catalog shows many delightful surprises in Diamonds, Watches, LaVallieres, Silverware, Toilet Articles, Cameras and Phonographs. Send for YOUR copy No. 89L. It's FREE!

THE HOUSE OF QUALITY
L·W·SWEET & CO. INC.
2-4 MAIDEN LANE, NEW YORK

10¢ Buys 100

Millions Billions in use to-day

Engel "Art Corners"

No Paste Needed

Use them to mount all kodak pictures, post cards, clippings in albums

Made in Square, Round, Oval, Fancy and Heart of black, gray, sepia, and red gummed paper. Slip them on corners of pictures, then wet and stick. QUICK-EASY-ARTISTIC. No muss, no fuss. At photo supply, drug and stat'y stores. 10c brings full pkg. and samples from Engel Mfg. Co., Dept. SF-1456 Leland, CHICAGO

Kodakers—Get Acquainted!

Developing and Printing by our NU-TONE Process. Largest laboratory in New York

Sizes:	Vest Pkt.	2¼x3¼	2¼x4¼	3¼x4¼	3¼x5½
Devl'g 6 exp.	.05	.05	.05	.10	.10
Printing ea.	.03	.03	.03	.04	.04

8x10 mounted enlargement 35c. All work prepaid

"SCHULTZ" KODAK SHOP, 122 Nassau St., New York

Will You Give $8.00 for Good Hearing?

Henry Hamann, inventor of this device, is 90 per cent deaf. With it he hears every word of public or private conversation distinctly—easily—clear as a bell.

Simple as it is ingenious. Made with super-sensitive sounding board. Intensifies sound. Gives you your former hearing. No batteries. Small, inconspicuous. **Get One, NOW**

Satisfaction Guaranteed or Money Back

Write for illustrated circular giving full details, or better still—send P. O. or Express Money Order for $8.00 and we will send you a Hamann Ear-Dome by Mail Postpaid. Try it 10 days and if you are not satisfied, return it and we will refund your money without quibble or question.

HAMANN EAR DOME COMPANY
3440 Indiana Ave. CHICAGO, ILL.

Nine solid-end wrenches—or one Crescent

One 10" Crescent Wrench takes the place of nine sizes of solid wrenches.

Would you rather carry one wrench or nine?

Furthermore, every Crescent is guaranteed to satisfy you, or your money will be refunded.

For sale by all good hardware dealers. Send for catalog.

CRESCENT TOOL CO.
JAMESTOWN, N. Y.

Crescent
ADJUSTABLE WRENCH

FREE. LAMP OR LANTERN

Akron Gas Lamps and Lanterns make best, cheapest light. Use gasoline. Simple, dependable, durable. Permitted by Insurance Companies. FREE TO OUR AGENTS.

GIVES 400-CANDLE POWER

Abundance of bright, clear, soft, steady light—restful to eyes. Fully guaranteed. AGENTS WANTED. All or spare time. Outfit free. Exclusive territory. Write for prices and FREE catalog. Sold at wholesale in open territory

AKRON GAS LAMP CO., 106 GAS BLDG. AKRON, OHIO

MAKE $25 A DAY with the "Diamond Post Card Gun"

Takes, Finishes Five Different Sizes Photo Post Cards and Buttons, Ready to be Delivered "ON THE SPOT." Big Money Maker at picnics, bathing beaches, fairs, carnivals. No experience necessary—no dark room, plates nor films. Small Investment! Large Profits! *Write for illus. circular.* FREE.

International Metal & Ferro Co., Dept. 14A, Chicago

Here's Health and Power, Vim and Vigor

Do you want them? Strength that is more than mere muscular strength. The strength, health, power and vigor of youth is now within your reach through the White Cross Electric Vibrator. Be strong—be healthy—enjoy things the way you used to. Write—learn what vibration may do for you.

The White Cross Electric Vibrator

With this machine in your home you can give yourself the treatments for which specialists receive $3.00 to $5.00. Can be connected up as easily as an electric lamp. Or, if your home is not wired for electricity, it will run on its own batteries. See it—try it.

Write Today For Our Big FREE BOOK!

Just your name and address on a letter or post card is enough. We will send you, absolutely free and prepaid, our new book, "Health and Beauty." It tells you about vibration and about our special offer. Write today.

Lindstrom-Smith Co., Dept. A119, 1100 So. Wabash Ave., Chicago

Re-NEW Your Old CLOTHES FOR 25 CENTS

With SHINE-OFF you can remove all the "Shiny" spots—all the Grease, Dirt, Oil, Fruit and Perspiration Stains, etc., from Trousers, Coats, Overcoats, Suits, Skirts, Dresses, etc.—easily and quickly.

Shine-Off

Sold With a Money-Back Guarantee

It never fails to remove "Shine". It cleans where other cleaners fail. The spots never come back.

Also recommended for Cleaning Rugs, Carpets, Canvas Shoes, Raincoats, Spats, Cloth Hats, etc.

The directions are simple and easy. It is harmless. Not a liquid. Buy SHINE-OFF from your dealer or send the coupon and 25c for a full sized package. 35c in Canada.

MANUFACTURED BY
UTILITY PRODUCTS CO., 17th Floor, Lytton Bldg., Chicago

MAIL COUPON TO-DAY

UTILITY PRODUCTS CO., Chicago
17th Floor, Lytton Bldg.
Enclosed find 25c for full package of SHINE-OFF.
Name.....
Street.....
City.....

Thread Pipe, Bolts and Nipples on One Machine

One man and this machine can beat a gang working with hand threading tools. Straight and bent pipe, even close nipples can be threaded easily and speedily.

OSTER Combination Machines will pay a big profit over hand threading.

The Oster Mfg. Co.
2100 East 61st St.
Cleveland, Ohio

30 A
One of these sizes threads ¼" to 2" pipe

Send for Catalog

Send list 30 to
Name..... Address..... City..... State.....

America's Finest Work Shirt

Worn by thousands of workers who demand something better than the average—wears like iron—fits to perfection. Two shirts in one—comfort on duty, neat on the street.

Signal Shirts

Made of TubTest Fabrics

have stood the test of competition for over 20 years. Made in several patterns. Every Signal Shirt guaranteed wash-proof, wear-proof and perfect fitting. Buy from your dealer—or write us giving your dealer's name.

Hilker-Wiechers Manufacturing Co.
Dept. P. M. Mound Ave., Racine, Wis.

Signal
SHIRTS & OVERALLS

Save on SOX

$1.75 PER DOZEN

500 doz. Men's Socks at less than wholesale. Well known brand, latest cuff-style top, fits snug, no garters needed; extra strong toe and heel; seamless; regular price, 35c pair. Our Special Price, $1.75 for full box, 12 pairs, postpaid. Assorted colors if desired.

Colors: Black, brown, grey.

Sizes: 9½-11½. Medium wt. Best French permanent lustre dyes, look like new after washing. Will not stain or crock. Positively not "seconds." Satisfaction guaranteed.

Send No Money Just mail your name and address. Be sure to state size. Sox will be mailed prepaid. On delivery pay postman $1.75. Money back quick if not satisfied that this is a bargain. Write today. This offer good for short time, U. S. only.

BACH BROS. References, Dun or Bradstreet
11500 Michigan Avenue, CHICAGO

Free Book

Containing complete story of the origin and history of that wonderful instrument—the

Easy to Play Easy to Pay

SAXOPHONE

This book tells you when to use Saxophone—singly, in quartettes, in sextettes, or in regular band; how to transpose from orchestral parts and many other things you would like to know.

You can learn to play the scale in one hour's practice, and soon be playing popular airs. You can double your income, your pleasure, and your popularity. **Easy to pay** by our easy payment plan.

MAKES AN IDEAL PRESENT

Send for free Saxophone book and catalog of True-Tone Band Instruments.

BUESCHER BAND INSTRUMENT CO.
270 Jackson Street, Elkhart, Ind.

Four Weeks' Trial

Piano or Player Piano

The Wing Piano and Player Piano

Yes, we will ship you on four weeks' absolutely free trial direct from our own factory your choice of 38 new styles of the highest-grade Wing Piano or Player Piano.

One of 38 Styles

No Money Down

Nothing on arrival; no freight either way; no deposit. Use it and enjoy it four full weeks; then, if you wish, ship it back at *our expense*. You alone are the judge. You will be amazed at our rock-bottom, direct price on the superb Wing, guaranteed 40 years. Easy monthly payments or cash—but first 4 weeks free trial. Write today.

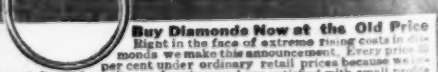
Valuable Book—FREE "The Book of Complete Information About Pianos" sent free and postpaid. Valuable 140-page book. Tells how to judge pianos. Beautiful art catalog also sent and particulars of great Free Shipment Offer. Write today—now.

Wing & Son (Est. 1868), Wing Building, 9th Ave. & 13th St., Dept A119, New York

1/2 Carat Genuine Diamond Ring $48.75

Buy Diamonds Now at the Old Price

Right in the face of extreme rising costs in diamonds we make this announcement. Every price 33 per cent under ordinary retail prices because we import direct from diamond cutters and are satisfied with small profits on a great volume of sales. You may still have full carats at $75.00, three quarter carat at $72.00 and one quarter carat at $20.00. Every stone guaranteed in writing.



$1.00 Full Size Fountain Pen. Full size, 6 1-2 inches long, lever, self-filler barrel and cap are pure Para rubber. Your name inlaid in gold free. Pen is 14K, solid gold iridium tipped. Guaranteed free repairs for 2 years. Special Factory Price to you $1.00.

Write for Diamond Catalog. Write today for the Basch DeLuxe Diamond Book. It is free. Best diamond guide ever issued. Send for it today sure. L. Basch & Co. Dept. N 3471, State and Quincy, Chicago, Ill.

YOU can BUILD this PHONOGRAPH *easily!*

TREMENDOUS SAVING IN COST

THE MAKAFONE "Build it Yourself"

You don't need to be a cabinet maker. We have made it an easy and a pleasant job with

Our Simplified Plans We furnish blue prints, diagrams, motor, and all metal parts complete. You build the cabinet and assemble. A few hours' work, and you will have as fine a type of phonograph as any produced, and at a price away below what you would pay in a store.

Keep the Savings in Your Pocket

Your machine will play all records, will have a wonderful tonal quality, excelled by none. No need now for any family to be without a phonograph because of the cost. THE MAKAFONE solves the problem. BUILD IT YOURSELF AT LESS THAN ONE-FOURTH REGULAR COST, but equal to the high priced cabinet machines. Free Records with each outfit. SEND TODAY FOR FREE CATALOG and full particulars of our wonderful offer. *Many a manufacturer got his start in this way. Why not you? Build machines and sell to your friends. Ask us about this.*

AGENTS ATTENTION

You can make and sell this machine from our plans at a profit of $50 to $75 each. Others are selling two and three a week. Here is your opportunity to make big money and become independent. Pleasant and profitable work. START TODAY.

MODERN PHONOGRAPH SUPPLY CO.
105 Springer Bldg., 313 So. Clinton St., Chicago, Ill.

WRITE TODAY!

MODERN PHONOGRAPH SUPPLY CO.
105 Springer Bldg., 313 So. Clinton St., Chicago, Ill.

Gentlemen: Please send me full particulars of your Makafone proposition, without obligation to me.

Name .....

Street Address .....

City or Town .....

When You Build

please bear in mind that there is still plenty of

WHITE PINE

Send for our free booklet, "WHITE PINE IN HOME-BUILDING"

WHITE PINE BUREAU
1626 Merchants' Bank Bldg. ST. PAUL, MINN.

Comfort Indoor Closet

Odorless, Sanitary, Germ-proof. Needed in every home. Set up by anyone in any room. Sent on Free trial.

WOOD SEAT AND COVER

Abolish cold out-door closet. Germ life killed by chemicals. U. S. Health Bureau approves. Boards of Health endorse it. Exclusive territory to Agents. Catalog Free.

COMFORT CHEMICAL CLOSET CO.
386 FACTORIES BLDG. TOLEDO, OHIO

MICROPHONES

EXPERIMENTAL—COMMERCIAL

The Skinderviken Transmitter Button will greatly improve the transmission of sound under most any condition. For telephones—land and wireless, detectiphones, deaf phones, stethoscopes, and hundreds of experimental adaptations, it is unequalled.

$1 Postpaid

Send a dollar now for a Skinderviken Button (guaranteed to satisfy or money refunded) and a copy of our latest catalog No. 4 of experiments, circuits and illustrated directions. If you want to investigate further, send a stamp for the catalog.

Skinderviken Telephone Equipment Company, Inc.

2136 N. Clark Street CHICAGO — 335 Broadway NEW YORK, N. Y.

Health Beauty Power

For Men and Women

Enjoy the keen zest of living that comes with braced nerves and pulsing blood, gained through the Therapeutic White Rays of the Sterling Lamp—a scientific adaptation of the marvelous healing properties of the sun's rays. The warm, soothing, soft, white rays penetrate and vitalize every cell and tissue; new cell growth is stimulated; the body refreshed and vitalized.

It brings you a clear, unblemished skin, rose-tinted cheeks, bright eyes; quickens the sluggish blood, rebuilds firm, new muscle, and clear, new skin.

STERLING THERAPEUTIC LAMP
"The Light That Heals"

Relieves pain without destroying vitality, no vibration, shock or pain. Rheumatism, neuralgia, sore throat, earache, goitre, headache, nervous conditions, and innumerable other ailments instantly eased and relieved. Does away with use of harmful drugs. Relief results the moment you snap the electric switch. Invaluable in treatment of skin diseases. Physicians endorse and recommend Therapeutic Light.

Send for Free Book Today

Our free book deals with the simple, fundamental laws of health and beauty—tells of its uses; how others in hospitals, sanitariums and thousands of private homes have benefited. Don't suffer headaches and other pains needlessly—let Nature and Science help you to health, beauty and greater vitality. Send for free book today.

Sterling Therapeutic Lamp Co.
Dept. 17, 546 Garfield Ave., Chicago, Ill.

CUT YOUR OWN HAIR

Particular People Cut Their Own Hair

Years ago we had to take "turns" at the barber shop for shaves and hair cuts. Today men shave themselves and cut their hair at home. It's part of the regular toilet to trim the hair a little every few days. It is easy to keep the hair trim and neat all the time with the

Cowan Master Barber Hair Cutter

Anyone can use it. Gives you a perfect hair cut in your own home. Keeps you always looking as well as when you stepped out of the barber's chair. Cuts your hair just as you want it. The Cowan is scientifically correct. Adjustable for trimming around ears and neck. Used as a safety razor also. A high-grade, carefully made article. Comes packed in attractive, convenient metal case. Lasts a lifetime.

10,000 in Use Over 10,000 satisfied users. The real proof is to write today for our special trial offer. Prove it to yourself. Why wait? You'll be cutting your own hair before long anyway—everybody will.

Mothers A Cowan will keep the boy's hair trim and neat all the time. Get one now and do away with those tiresome trips to the barber shop.

FREE! Send today for trial offer and folder that tells all about the Cowan and how you can try it at our risk.

COWAN HAIR CUTTER CO.
Dept. 7 Kansas City, Mo.
Dealers and Agents Wanted

MEN will be surprised at what we have ready for our **Spring Soft Shirt Showing.**

3 FINE MADRAS SHIRTS $3.85 Postpaid
Staple Blue—Helio—Black Printed Cluster Stripes

Our shirts have features of quality not always found in shirts at higher prices—such as, beaded neck bands, full body measurements, stripes carefully matched and buttons of extra fine quality pearl. **WRITE TO-DAY.**

The BERTEX Distributing Co., Inc., 124 W. 18th Street, New York City

Be An Oil Expert

Earn $3,000 to $10,000 a Year

Many of the biggest Oil and Petroleum Institutions in the world come to us daily for Oil Experts and Lubrication Engineers. WHY? Because we teach thoroughly, without interfering with other duties, how to

—Refine
—Test
—Blend
—Compound
—Correct
—Recommend
—Judge
—Apply
—Lubricate
—Sell
—Buy
—Reclaim

National Petroleum Schools
Room 405 Dexter Bldg., CHICAGO

Gentlemen: Send me FREE, without obligation, full particulars of positions open and how to qualify for them.

NAME .....

ADDRESS .....

Ocean Travel ON THE Inland Seas!

Magnificient D & C Lake Steamers are in Daily Service, Detroit and Cleveland, Detroit and Buffalo; four trips weekly on the Coast Line to "America's most beautiful island"—Mackinac. On D & C Steamers, you can always keep in touch with your affairs by wireless

Detroit and Cleveland Navigation Co.
Philip H. McMillan, Pres., A. A. Schantz, V. P. & Gen. Mgr.
Send 3c Stamp for Booklet to
L. G. LEWIS, Gen. Pas. Agent, 9 Third Avenue, Detroit

Jingle Contest

If you can write a jingle,
--One that sets the blood a tingle,
To sail the waters blue, with pleasant skies--
Come now, married folks and single,
With the winning jinglers mingle,
And wear a brooch of gold--for that's the prize.

Five gold "Sea Goddess" Brooches, jewel-set for women, will be awarded the best jinglers. The twenty-five next best efforts will be rewarded with brooches of lesser value.

Jingle Contest Closes July 1
Mail to "Jingle Editor"
Detroit and Cleveland Navigation Company
Detroit, Mich.

SERVICE GIVING TIRES-TUBES

ROCK BOTTOM PRICES
Adjustment Troubles Eliminated
BRAND NEW TIRES and TUBES

at exceptionally low prices. To appreciate these wonderful values send us a trial order.

Size	Tires	Tubes	Size	Tires	Tubes
30 x 3	$ 9.10	$2.00	36 x 4	$23.15	$3.65
32 x 3	11.00	2.25	32 x 4½	25.00	3.75
30 x 3½	11.75	2.45	33 x 4½	25.75	3.75
32 x 3½	13.80	2.65	34 x 4½	26.60	3.80
34 x 3½	16.15	2.75	35 x 4½	27.85	4.00
31 x 4	18.00	2.75	36 x 4½	28.25	4.50
32 x 4	18.50	2.80	37 x 4½	32.35	4.50
33 x 4	19.30	3.35	35 x 5	31.75	4.50
34 x 4	19.75	3.50	36 x 5	35.85	4.50
35 x 4	22.50	3.50	37 x 5	33.55	4.50

10% more for non-skid.

Terms One Dollar deposit with each tire ordered. Balance C. O. D. with privilege of examination. 2% cash discount when remittance in full accompanies order. Tires may be returned for full credit if not satisfactory upon examination. Although above tires bear no mileage guarantee, we will cheerfully make reasonable adjustment should they prove unsatisfactory. Tires for adjustment must be sent in by prepaid express

BANNER TIRE CO.
1356 So. Michigan Ave., Chicago, Ill.

Agents Wanted!

For the "Big Four" Ro-San Sanitary Specialties for Homes Without Plumbing

Ro-San Indoor Closet Two sizes—one for farm and village homes; one for large homes, schools, factories, churches, stores, etc.

Ro-San Washstand Hot and Cold Running Water without Plumbing.

Rolling Bath Tub, With Heater A Wonderful proposition—just out—everybody eager for it.

These four specialties will make any hustler **big money.** You can fit out any home with a complete bathroom. We want live wires everywhere to represent us, either part or all of their time. Special proposition to men who can direct men and organize territory and who can carry small stock.

A real opportunity is before you. This "big four" means wealth for those who go after it—because every farm and village home wants what we have to offer. **Write today.**

Rowe Sanitary Mfg. Co.
13506 6th St.
DETROIT, MICH.

NEW SONG HITS I've Got a Little Home in The Country / When You're Lonely, (Won't You Come Back To Me) / Clovertime—The Busted Blues—Happy Days

Get them from any music counter or sent direct from publishers for 12c each. All five for 55c postpaid. **WONDERLOVE,** a semi-high class waltz serenade 30c. **SAY NUFFIN**—a pianolog 30c. Both 30c songs and five popular songs as above for $1 postpaid. If you want them for your Phonograph or Piano Player ask any dealer.

C. ARTHUR FIFER MUSIC CO., Publishers, QUINCY, ILLINOIS

SALESMEN!

You who are looking for permanent, profitable connection calling on factories, automobile owners, garages, hardware stores, farmers, electricians etc. Sell Power Pulleys big commissions—easy sales—quick returns. See Ad page 116 May issue Popular Mechanics.

Write **BICKLEY MFG. CO., 1033 Chestnut St., Philadelphia, Pa.**

FREE
For 10 Days Wear

Send no money. Just ask us to send you either of these wonderful, dazzling, genuine Tifnite Gem rings to wear for 10 days. If you can tell it from a diamond, send it back. Tifnite gems stand every diamond test.

No. 1. Solid gold mounting. Eight-claw design flat wide band. Almost a carat, guaranteed Tifnite gem.

No. 2. Solid gold Ladies' Tiffany mounting. Has a guaranteed genuine Tifnite Gem, almost a carat.

No. 3. Solid gold six-prong tooth mounting. Guaranteed genuine Tifnite Gem, almost a carat in size.

In sending, send strip of paper fitting around second joint of finger. If satisfied upon arrival send $3.50—then $3 monthly until the price, $12.50, is paid for either one. Otherwise return the ring within ten days and we will refund any payment made. This offer is limited. Send while it holds good.

The Tifnite Gem Co., Dept. 440, Chicago

GILBERT'S New Wheel Toy

Makes This Fine Coaster and Other Great Toys

You can make lots of other fine things too, easy as rolling off a log—a sporty wagon, a dandy geared racer, a glider that is better than the regular ones, a big wheelbarrow, a baggage truck—something new every week.

These toys are not models or flimsy affairs but are exceptionally strong and sturdy. With a screw driver and a wrench and the things in the outfit any boy can make the glider, wagon, coaster, etc., in no time at all.

Say!—You certainly can have fun with one of these outfits. They contain four remarkably strong and handsome steel wheels—the classiest wheels you ever saw for carts and racers and gliders. There are steel axles, nuts, bolts, angle irons; tough bars and boards of hard wood for handles, seats, etc., and two fine sets of bright red steel plates, drilled with small holes for the bolts. One set at $6 (Canada $9), and a great $10 outfit (Canada $15) with gears and pinions and lots of additional parts. A big $15 set also (Canada $22.50).

Name This Toy—Win $100

To the boy or girl under 18 years of age from whom we receive what we consider to be the best name for this new wheel toy—up to 5 P.M. July 31st, 1919—we will pay $100 in cash. If two or more contestants send in the name selected, each will receive $100. No entry blank or fee is required. Just send in the name you suggest on the coupon below, writing your own name and address plainly.

To every boy or girl who writes us we will send a FREE copy of our boys' magazine, Gilbert Toy Tips, full of fine stories and containing all the details of another big prize contest with a real buckboard automobile or a Shetland pony as leading prize. Our complete Toy Catalog will also be sent free.

The A. C. Gilbert Company
104 Blatchley Ave.,
NEW HAVEN, CONN.

In Canada:
The A. C. Gilbert-Menzies Co., Ltd.
Toronto, Ontario

$100 CONTEST COUPON

The A. C. Gilbert Co., 104 Blatchley Ave., New Haven, Conn.

I suggest ..... as a name for Gilbert's new toy

My name is .....

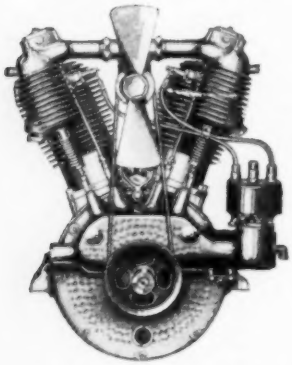
Address .....

City .....

State .....

Age .....

SPACKE 9-13 DE-LUXE MOTORS



This Efficient Motor Has Hundreds of Uses—

It weighs 100 pounds—yet develops 9 to 13 horse power on half the gasoline consumption of the average gasoline engine. Thousands have been proved in hard service.

Designers and manufacturers in many lines, such as those shown here, have found wonderful value in its use.

Wherever light weight, power and efficiency are needed the Spacke 9-13 De-Luxe Motor sets new standards for design, manufacture and service.

Ask For Folder

The Spacke Motor Folder with Specifications, test records, installations and complete information will be sent you on request. Write for it today.

The SPACKE Machine & Tool Co.

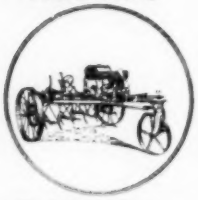
Makers of

Spacke Motors, Spacke Axles and Automotive Parts

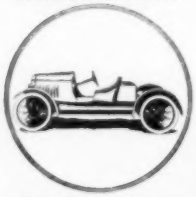
INDIANAPOLIS, U. S. A.

for

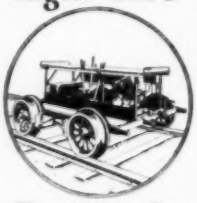
Tractors



Cultivators



Light Cars



Ry. Speeders

Power Mowers

Boats

Please Mention Popular Mechanics

Put the
Power of Emphasis Into Your Letters
Just as you do with the *Spoken* Word.

"Just Turn the Knob" on the MULTIPLEX HAMMOND

Standard *"Writing Machine"*

—and you have a Different Style of Type

Increase the effectiveness of your letters by putting the **power of emphasis** into your typewritten work. **Emphasize the important parts** by changing instantly from one style of type to another.

The Multiplex is *unlike* any other typewriter—there are **over 365 different type-sets**, including all languages, to select from. **Note these seven styles:**

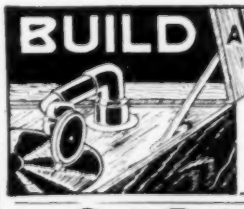
Vertical Script - private letters.
Medium Roman-general letters.
Italic - emphasizing.
SPECIAL GOTHIC - CLEAN CUT
Large Gothic - sermons, lectures.
Large Roman - sermons, lectures.
Print-type - new, attractive.

Send for FREE PAMPHLET

"The President and His Typewriter" and other descriptive literature explaining the unique features of "The Typewriter of Personality"—the Multiplex. Write your name, address and occupation on the margin of this page **NOW** and mail to

HAMMOND TYPEWRITER CO. 569-A East 69th St. NEW YORK CITY

Also—an Aluminum PORTABLE Model 11 lbs. Full capacity. Ask for special folder.



BUILD A $100.00 PHONOGRAPH

MAKE YOUR OWN RECORDS on your own Victrola

ELECTRO-MECHANICAL PARTS CO.
160 N. Wells St., Chicago, Ill.

$8.85 ELECTRIC FAN COMPLETE!

Price includes plug and 8 ft. cord. Universal motor good on alternating or direct current. Finished in black enamel. 11 inches high. Weighs 7 pounds.

AGENTS AND DEALERS WANTED!

Big money will be made this summer by men who represent us on this **$8.85** Fan. WRITE FOR OUR OFFER **TODAY.**

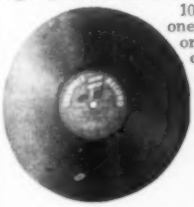
Tewno Co., 150 Chambers St. New York City

Why live AN INFERIOR LIFE?

I can prove to you that you are only half as alive as you must be to realize the joys and benefits of living in full. I can show you how, without drugs or medicines or dieting, without excessive exercise, without giving up any of the pleasures of life, you can revitalize, re-energize, restore every cell, tissue and organ of the body and become a **Giant** in health and mind. The secret of wealth, health and happiness is fully explained in Swoboda's new books, "Conscious Evolution" and "The Science of Life." In them, hundreds of pupils tell what this great discovery has meant to them in increased earnings, increased ability to live the well-rounded, wholly successful life. This great book will be sent free to all who are interested in greater health and mental power. Write today—now—before you forget. **ALOIS P. SWOBODA, 2302 Berkeley Bldg., New York City**

refund any payment made. This offer is limited. Send while it holds good.
The Tifnite Gem Co., Dept. 440, Chicago

Columbia Records



10-inch double faced records, every one the new genuine COLUMBIA Records, in a wide selection of bands, orchestral, dance and instrumental and vocal solos.

10 Records (20 selections) **$4.90**
5 Records (10 selections) **$2.75**
1 Record, each (2 selections) **61c**

2202—**Poor Butterfly. Madam Butterfly.**
2481—**Everybody's Crazy 'Bout the Doggone Blues, But I'm Happy**.....Geo. H. O'Connor, Tenor
I Ain't Got Nobody.....Geo. H. O'Connor, Tenor
1925—**The Ghost of the Terrible Blues**.....Peerless Quartet
Oh! Oh! Oh! He's Breaking My Heart.....Marguerite Farrell, Soprano
2298—**12th Street Blues**—Fox-Trot.....Novelty Orchestra
Cold Turkey—One-Step.....Novelty Orchestra
2421—**Snaky Blues**—Fox-Trot.....Dixie Jazz Orchestra
Fuzzy Wuzzy Rag—One-Step.....Dixie Jazz Orchestra
2233—**It's a Long, Long Time**—Fox-Trot....Dixie Jazz Orch.
Just the Kind of a Girl (You'd Love to Make Your Wife)—One-Step.....Dixie Jazz Orchestra
2417—**Sweet Child**—One-Step.....Dixie Jazz Orchestra
Old Town Pump—Fox-Trot.....Dixie Jazz Orchestra
1771—**Mother, May I Go In to Swim?**....Ada Jones, Soprano
You For Me in the Summertime.
1722—**By Heck. Pigeon Walk.**
2138—**All America March. Directorate March.**
2174—**Beauty's Eyes. Mona.**

And 300 Other Popular Selections

A Complete List on Request

Columbia Grafonola

Dealers: STOCK UP ON THESE RECORDS

Acme Record Exchange
140 So. Wabash Ave., CHICAGO

Columbia Grafonola

MAKE A PHONOGRAPH

BUILD IT YOURSELF

$9.85 for For All Metal and Moving Parts

Build this **$100.00 phonograph** yourself. An astounding money saving offer. All you need are these finest quality parts. We give you all instructions including detailed blueprints. All parts listed included in this wonderful offer for **$9.85**

EXTRA SPECIAL

1 Full Force Spring Motor No. 1. 1 10-in. Turn Table. 1 Tone Arm—Reproduces All Records, Type D. 2 Needle Cups. 2 Pairs of Hinges. 1 Motor Handle. 1 Outside Brake. 1 Needle Rest. 1 Tone Modulating Rod. 1 Cover Support. 1 Package Needles. 2 Door Friction Catches. 2 Door Knobs—Brass or Wood. 4 Casters. 1 Speed Regulator. 3-10 in. Double Faced Records (6 Selections).

ALL PARTS ABOVE LISTED WITH BLUEPRINT AND FULL INSTRUCTIONS FOR BUILDING THE **ACMEPHONE** FOR **$9.85**

Make your own cabinet or use a table or other piece of furniture. All metal exposed parts heavily nickeled. Motor full force spring with speed regulator. Tone arm plays all makes records including **Victor, Columbia, Pathe and Edison.** Send today for full set working parts with instructions complete. Send coupon today. Your money back if not satisfactory.

DEALERS:
Write us for our special Acmephone Proposition.

ACME MANUFACTURING CO.
140 So. Wabash Ave., Chicago

COUPON

ACME MFG. CO.,
140 So. Wabash Ave., Dept. 3, Chicago, Ill.

GENTLEMEN:—I wish to take advantage of your special limited offer of complete set of metal and moving parts as listed for $9.85, including blue prints. I enclose $9.85 and if I am not satisfied I will return parts to you and get my money back in full.

NAME.....

ADDRESS.....

ELECTRICITY

TAUGHT BY A PRACTICAL MAN

Send for Catalogue

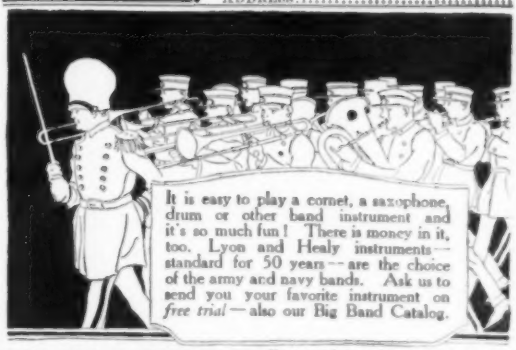
BURGESS ELECTRICAL SCHOOL
YORKE BURGESS, Supt., 744 E. 42nd Street, CHICAGO, ILL.

ASBESTOS

We are miners and shippers of Crude Asbestos in any quantity. We produce all grades at our world-famous BELL ASBESTOS MINES, in Canada. We also card fibres, spin yarns, weave cloths, and make all sorts of Asbestos products.

For anything you want in Asbestos, turn to

KEASBEY & MATTISON COMPANY
Dept. S-3, AMBLER, PENNA., U.S.A.
Owners of the world's largest Asbestos Mines



It is easy to play a cornet, a saxophone, drum or other band instrument and it's so much fun! There is money in it, too. Lyon and Healy instruments—standard for 50 years—are the choice of the army and navy bands. Ask us to send you your favorite instrument on *free trial*—also our Big Band Catalog.

LYON & HEALY *Everything known in music*
55-98 Jackson Blvd., Chicago

EARN $3000 to $5000

a Year Selling Our Triple Traction Tread

A wonderful new process that will make old, worn-out tires that the owners are ready to throw away, non-skid and puncture-proof. Think of the profit in that! IT'S ALL IN THE TREAD!

Be Independent—Go Into Business for Yourself

If you have a little extra capital—$500 or more—it can be made to earn you a big income. Wouldn't you like to be the big man in your town?

Don't Overlook This Splendid Chance of getting into a business that will make you independent for life. Opportunity is knocking at YOUR door! WRITE US TODAY.

TRIPLE TREAD TIRE COMPANY
1422 So. Michigan Ave. Dept. P CHICAGO, ILL.

Moore's Universal Assistant and Complete Mechanic

Contains 1016 Pages, 500 Engravings, and Over 1,000,000 Industrial Facts, Calculations, Receipts, Processes, and Trade Secrets for Every Business!

For Sterling Value, Elegance, and Low Cost, This Work Has No Compeer in the English Language

The Work contains 200,000 items for Gas, Steam, Civil and Mining Engineers, Machinists, Iron Founders, Plumbers, Metallurgists, Assayers, Miners, Builders, Metal and Wood Workers, Manufacturers, etc. Full details (with 500 Engravings) for constructing, operating, and repairing Mill and Steam Machinery of every kind, setting of Valves, Link and Valve Motion, Eccentrics, Indicator Diagrams, Injectors, Steam Boilers, Gauges, Machinists' Tools, Mechanical Movements, Tunnelling, Mining and Rock Drilling Machinery, Wheel Gearing, Gas Meters, Diagrams for Sheet Metal Workers, Views of Noted Buildings, Bridges, Plans of Mills, etc.

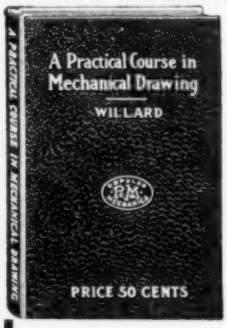
FULL INSTRUCTIONS TO ENGINEERS, FIREMEN, BOILER MAKERS, ENGINE AND CAR BUILDERS, ETC. Proportion of Engines, Repairing Locomotive Break-Downs on the Road, Boiler and Steam Pipe Covering, Cements—69 kinds, Bright Polish—4 kinds, Scale Preventives—10 kinds to Clean Waste, Details for Cotton, Woolen, and Fulling Mill Machinery; ditto, for Flour, Oatmeal, Saw, Shingle, Planing, Paper and Wind Mills, Grain Elevators, Sugar, Oil, Marble and Rolling Mills, Blast Furnaces, Gas Works, Water Works, Mill Dams, Water Wheels, Hydraulics, Cotton Presses, Speed of Wheels, Pulleys, Drums, Circular Saws, Woodworking Machinery, Horse Power of Streams, Belts, Strength of Metals, Timber, Building Materials, etc. Seasoning of Timber—12 ways, Growth of Forest Trees, Logging, Cost of Supplies, Stream Driving, Lumber Measurement and Surveyors' Tables, full and complete. Views of Lumbering Scenes, Saw Mills, Saw Filing, etc., etc.

PRICE ONLY $2.00 POSTPAID

Popular Mechanics Book Dept.
6 N. Michigan Ave., Chicago

Please Mention Popular Mechanics

YOUNG MAN! LEARN DRAFTING



ONE of the most practical subjects of study today; an essential in most lines of engineering; indispensable in many occupations and often the secret of successful advancement; of no less importance to the farmer than the mechanic. There is bound to come a time when you will feel the need of the ability to "lay out" something in accordance with the rules and conventions used in the drafting profession.

Individual Study

may be successfully engaged in with the aid of our new enlarged edition of the book

A Practical Course in Mechanical Drawing

By WM. F. WILLARD

(For several years instructor in Mechanical Drawing at Armour Institute of Technology, Chicago)

160 PAGES — SIZE 5x7 — 157 DRAWINGS — CLOTH COVER

Price 50 Cents, Postpaid

There has been a real need for a book of this kind, as it clinches each problem in the mind of the student by giving the practical application of that problem to every day practice in some phase of the world's work. It meets every modern requirement and is in advance of any other work on the subject. Excellent for use in shop classes, trade or high schools.

Order of your Book Dealer or direct from the publishers

POPULAR MECHANICS BOOK DEPT.
6 N. Michigan Ave., CHICAGO

SHOP NOTES FOR 1919

"Easy Ways to Do Hard Things"

NOW READY

Volume XV of the series of Shop Notes Books reprinted from Popular Mechanics Magazine contains

552 Articles
463 Illustrations
232 Pages

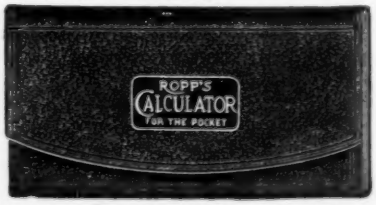
PRICE 50 CENTS, POSTPAID

Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago

Mathematics Made Easy by ROPP'S CALCULATOR

AND SHORT-CUT ARITHMETIC

Shows the Answer as Quickly as a Watch shows the Time to all Problems likely to occur in the Office, Store, Shop, Bank, Farm, or Factory.



Over 2,000,000 Sold

Explains and simplifies every principle in Arithmetic, Mechanics, and Mensuration.

PRICES, POSTPAID

Leather, Pocket Size..... $1.00
Leather, Vest Pocket Size..... $0.50
Pocket Size... $0.50

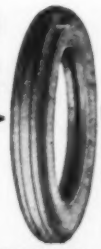
Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago

Make $6000 to $8000 a Year Retreading

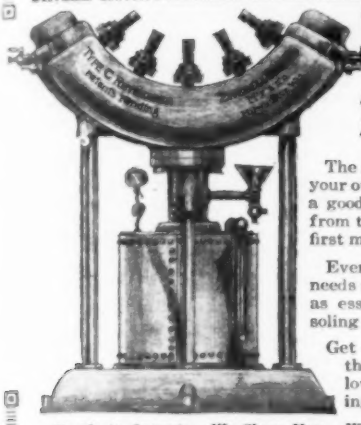
WORN TIRES, LIKE THIS

—good for 3500 to 6000 miles with the

New Improved Zwebell



SINGLE CAVITY RETREADER and TIRE REBUILDER



Pays Back its cost in 10 Days

Let Us Send You the Evidence

The chance to be your own boss. Pays a good profit right from the start—the first month.

Every car owner needs this service—as essential as resoling shoes.

Get started while the other fellows are thinking it over.

Simple to Operate—We Show You. Write Today.

ZWEBELL BROS. CO., Dept. A, Milwaukee, Wis.

RED OR BLACK **VULCAN INK PENCILS** LONG OR SHORT

$1.25 POSTPAID

Only Perfect Non-Leakable Ink Pencil at a moderate price. Your name in gold inlay 35c. FREE: Liberal supply of ink with retail orders. Agents Wanted. Big profits. **J. C. ULLRICH & CO., 27 Thames St., NEW YORK**

PRICES SLAUGHTERED

RELIABLE DOUBLE TREAD TIRES *"The Old Reliable"* GUARANTEED FOR 4,000 MILES

SIZE	TIRES	NEW TUBES	SIZE	TIRES	NEW TUBES	SIZE	TIRES	NEW TUBES
30 x 3	$5.00	$1.35	33 x 4	$8.75	$1.70	35 x 4½	$9.50	$1.80
30 x 3½	6.00	1.45	34 x 4	8.75	1.70	36 x 4½	9.75	1.85
32 x 3½	6.50	1.50	36 x 4	9.00	1.75	37 x 4½	10.25	1.90
31 x 4	7.25	1.60	34 x 4½	9.25	1.75	37 x 5	11.00	2.20
32 x 4	8.00	1.65						

For Non-Skids add 10 per cent to above prices

Reliner Free with Each Tire. In ordering state whether S. S., CL or N. S. is desired. Send $1 deposit for each tire, balance C.O.D. subject to your examination. **Be Economical**—Send entire amount of order and save 5 per cent discount for cash, plus 25c return of C. O. D. charges.

ORDER TODAY. Also Complete Stock of New and Used Tires—Write for Prices.

THE RELIABLE TIRE CO., Dept. P, 3457 Michigan Ave., Chicago, Ill.

EXTRA Send No Money SPECIALS

$67.50 A 194

7 BLUE WHITE DIAMOND CLUSTER RING SOLID 14 K GOLD MOUNTING - LOOKS LIKE ONE CARAT SOLITAIRE

Any of these specials sent for free examination. If satisfied—remit cash; if not, simply return goods.

Highest Quality Diamonds, Watches and Jewelry at ROCK BOTTOM PRICES.

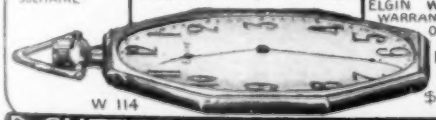
FREE CATALOG

Catalog 3G with 1,928 gift suggestions priced from 75c to $1200. **FREE. Write to-day.**

OUR GUARANTEE

Money back if not satisfied or if you can purchase cheaper elsewhere.

AL 99 SOLID GOLD FINELY CHASED BIRTHSTONE RING - STONE FOR ANY MONTH $7.75



W 114

GUARANTEED ELGIN WATCH WARRANTED OCTAGON GOLD FILLED CASE $10.95

B. GUTTER & SONS JEWELERS AND DIAMOND MERCHANTS

ESTABLISHED 1879 170 Nassau St Dept 3-G NEW YORK OPPOSITE CITY HALL

Please Mention Popular Mechanics

SENECA CAMERAS

WITH

Anastigmat Equipment

Give Much Greater Speed

Anastigmats F:6.3 pass 61% more light than the ordinary Rapid Rectilinear Lenses. You can make photos of objects in rapid motion or take snap shots on dull days.

It will pay you to look into Anastigmat equipments described in the complete Seneca catalogue free at your dealers or direct.

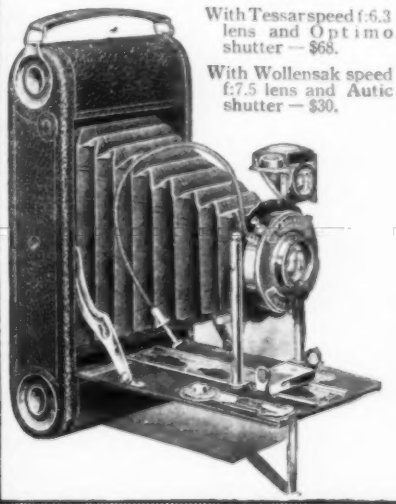
Seneca Camera Mfg. Co.

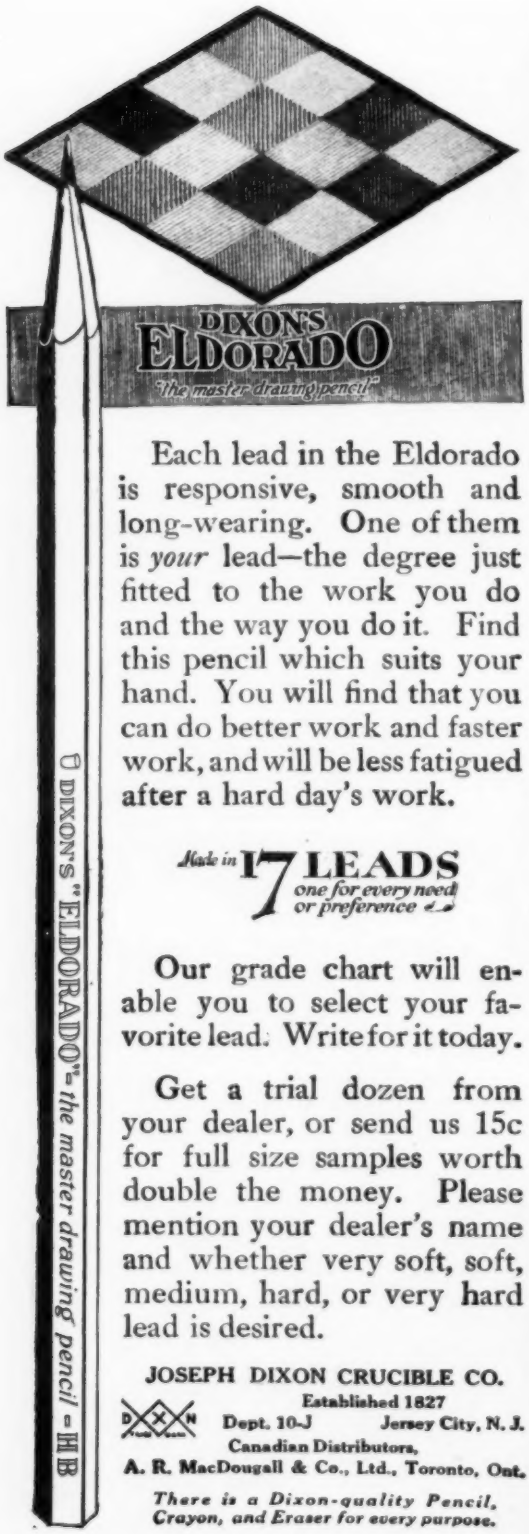
ROCHESTER, N. Y.

This 3A Roll Film Seneca

With Tessar speed f:6.3 lens and Optimo shutter — $68.

With Wollensak speed f:7.5 lens and Autic shutter — $30.





Each lead in the Eldorado is responsive, smooth and long-wearing. One of them is *your* lead—the degree just fitted to the work you do and the way you do it. Find this pencil which suits your hand. You will find that you can do better work and faster work, and will be less fatigued after a hard day's work.

Made in **17 LEADS** *one for every need or preference*

Our grade chart will enable you to select your favorite lead. Write for it today.

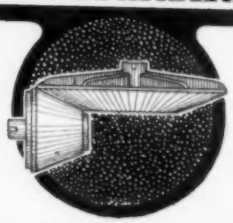
Get a trial dozen from your dealer, or send us 15c for full size samples worth double the money. Please mention your dealer's name and whether very soft, soft, medium, hard, or very hard lead is desired.

JOSEPH DIXON CRUCIBLE CO.
Established 1827
Dept. 10-J Jersey City, N. J.
Canadian Distributors,
A. R. MacDougall & Co., Ltd., Toronto, Ont.

There is a Dixon-quality Pencil, Crayon, and Eraser for every purpose.

Please Mention Popular Mechanics

ROCKWOOD
Friction Transmission



Better Than Toothed Gears

Where you need high speed, quick starts and sudden stops, your machine should be equipped with Rockwood Friction Transmission.

It does away with toothed gear inefficiency. Stops noise, eliminates power losses, gives greater speed range, costs less; requires fewer repairs. Simple in construction; easy to operate.

No matter what machine you are designing or building, let us show you where Rockwood can save money and increase value.

92-Page Book Free

Send today for this big, valuable book, "Friction Transmission." Full of helpful data.

THE ROCKWOOD MFG. CO.
1946 English Ave., Indianapolis, U. S. A.

The Envelofile A patent index envelope filing system for keeping track of an endless variety of things. Interesting and Instructive. Useful for thousands of things. Alphabetical index with double pocket envelopes. Letter size, $2. Document size, $3. *Send for Booklet.*
THE ENVELOFILE AGENCY, Chicago, Ill.

COLUMBIA DRY AND STORAGE BATTERIES

RACING PROPELLER WHEELS
REVERSE PROPELLERS AND MARINE ACCESSORIES
Large catalog free. Send today. Full of valuable information to every boat owner.
MICHIGAN WHEEL COMPANY
1139 Monroe Ave. Grand Rapids, Mich.

KOR-KER
ELIMINATES TIRE TROUBLES
Seals Punctures — Stops Slow Leaks

Gives 50% more mileage. Preserves tubes. 7 *years' success in 40 countries.* Not a filler. Does not affect resiliency. Keeps tires fully inflated. Prevents rim cuts, etc. *Send for booklet.*

ALCEMO MFG. CO.
7 Bridge St. NEWARK, N. J.

MONARCH LATHES

QUALITY construction and workmanship. Accuracy in operation and the ability to perform the same high class work as that of the more costly tool has established the leadership of the Monarch line.

Quantity production of a high grade machine tool has made possible the low prices that place the MONARCH lathes within the reach of every large or small purchaser.

Made up to 30" swing, there is a Monarch lathe to do your work. Every one guaranteed to give satisfaction to the purchaser. **Write for catalog No. 11.**

America's Largest Lathe Builders

The Monarch Machine Tool Co.
100 Oak Street Sidney, Ohio.

Makes Old Autos Look New

Price $2.50 Each

Dress up the old car—make it look new and up-to-date. Use Marvel Auto Curtain Windows. Install yourself in five minutes' time. No mechanical skill or special tools required. Discard those dingy, crinkled, broken or punched out bits of stitched in celluloid.

Use Marvel Windows — they are distinctive in appearance—of beveled plate glass set off with nickel trim.

Install Yourself

DEALERS
Write for our money making proposition.

THE MARVEL CO. 140 So. Wabash Avenue Dept. 2 CHICAGO

Demonstrating Tires and Tubes

SEND NO DEPOSIT WE SHIP C. O. D. ON APPROVAL

Size	Price Tires	Price Tubes	Size	Price Tires	Price Tubes
30x3	$ 6.50	$1.75	34x4	$12.50	$2.35
30x3½	7.50	1.90	33x4½	13.50	2.50
32x3½	9.00	2.00	34x4½	13.50	2.60
31x4	9.50	2.05	35x4½	14.00	2.65
32x4	10.50	2.15	36x4½	15.00	2.75
33x4	11.50	2.25	35x5	15.50	2.85
			37x5	16.50	2.95

All goods shipped promptly. Specify whether Clincher or Straight Side. Special proposition to dealers on new tires and tubes.

ROYAL TIRE & SUPPLY CO.
DEPT. P
1461 Michigan Avenue, CHICAGO, ILL.

The Famous "MARK II" Hand Grenade

Every soldier will recognize the good old "MARK II." Used by the millions on the boche trenches in France. The finest war souvenir you can buy — just right for a paper weight. Equipped with firing mechanism, but unloaded.

As manufacturers we have permission to sell a limited quantity — handsomely nickel-plated. This is the first public announcement and you will have to act quick to get one.

Just Send $1

A dollar bill with your name and address will bring you the famous "MARK II" Hand Grenade by return mail. Address

The SPACKE Machine & Tool Co.

Dept. E Indianapolis, U.S.A.

The "MARK II" Hand Grenade offers a wonderful opportunity for live agents and dealers. Write quick for special discounts in quantities before the supply is exhausted.

MAKE YOUR OWN MISSION FURNITURE

Anyone can—in their spare time—at home make simple, practical and unique mission furniture for every room in the house as well as chairs and swings for the porch and lawn. These books contain all the latest designs. Full directions, dimensions and working drawings. Written in plain language which anyone can read and understand. The instructions are so simple and so thorough that the amateur can make useful and ornamental furniture for himself and others. Furniture which has a distinctive charm and rare beauty.

MISSION FURNITURE

How to Make It

Three Volumes bound in cloth, shipped prepaid to any address for $1.50 or any one of the three for 50c.

Vol. 1—128 pages, 30 designs, 50c. **Tells How to Make**—Dining chair—lamp stand and shade—porch chair—tabouret—morris chair—book rack—library table—candle stick—novelty chair—magazine stand—lawn swing—combination billiard table and davenport—book shelves—blacking case tabouret—roll top desk—Roman chair settee—pyrographer's table—piano bench—shaving stand—waste paper basket—cellarette pedestal—princess dresser—sideboard—hall or window seat—plant stand—bedside medicine stand—hall chair.

Vol. 2—128 pages, 32 designs, 50c. **Tells How to Make**—Two China closets—rocker—side chair—mantel clock—lamp stand—two footstools—bookcase—magazine stand—smoking table—wall case—wastepaper basket—music stand—hall clock—cedar chest—child's dresser—couch—oil lamp—grill—two writing desks—library set—buffet—bedstead—dining table—medicine cabinet—telephone stand—plate rack—dining room shade.

Vol. 3—128 pages, 36 designs, 50c. **Tells How to Make**—arm chair—arm dining chair—hall bench—piano bench—book rack—book stand and music rack—book trough—chafing dish buffet—folding card table—side chair—writing desk—dictionary and magazine stand—round dining table—princess dresser—fern stand—foot warmer—hall tree—library table—magazine rack—magazine stand—pedestal—plate rack—porch swing—screen—serving table—settee—sewing table—sewing box—wall shelf—sideboard—umbrella stand—den table—oak table—tabouret—wardrobe—window seat.

Easy to Make—Worth Making

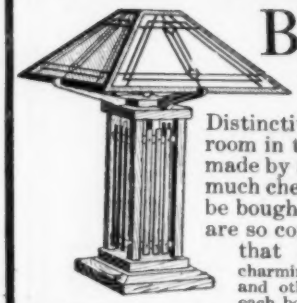
The large variety of designs contained in these volumes are so simple to make that anyone with the necessary tools can make them in a short time—at home. Save money making it for yourself. Make money selling it to others. Many designs in furniture which cannot be bought.

Three Vols.—Prepaid $1.50

Buy these three books for $1.50 or separately for 50c each. Send today. Use your leisure hours. Save money. Make money. Sent prepaid to any address upon receipt of price. Get these books now while the amazingly low price lasts.

POPULAR MECHANICS BOOK DEPT.
6 North Michigan Ave., Chicago

50 Cents



BUYS either of these books which tells how to make many beautiful designs in lamps. Distinctive designs for every room in the house. Can be made by anyone—at home—much cheaper than they can be bought. The instructions are so complete and simple, that anyone can make charming lamps for themselves and others. The designs in each book range from simple reading lamps to elaborate chandeliers. These books contain photographs of complete designs—together with complete instructions, dimensions, and detail drawings of all models. You can save many times the cost of these books on your first lamp.

Arts-Crafts Lamps

How to Make Them

This book contains working directions for 16 beautiful designs of large variety to be constructed from paper, card-board and wood. Designs which cannot be bought. Designs which have a distinctive touch of originality. Designs which **you** can make. Handsomely bound in cloth—96 pages (5x7 in.), 50 illustrations, diagrams and working drawings.

Tells How to Make Two Light Portable—Portable Reading—Four Light Chandelier—Reading Lamp—Dining Room Dome—Porch or Den Lantern—Four Light Chain Hung Chandelier—One Light Portable—Lantern—Drop Light—One Light Bracket—Piano Lamp—Wall Lamp—Electric Candle Sconce—Newell Post Lamp—Chain Hung One Light Bracket.

Easy To Make. You can save money making these lamps for your home. You can have lamps which no one else has. This is your opportunity to show yourself just what you can do. Send for this volume today.

Lamps and Shades

In Metal and Art Glass

Contains 18 designs which **you** can make, using wood, art-glass, and metal. Contains 128 pages (5x7 in.), 64 illustrations, diagrams, etc., durably bound in cloth. Instructions are so clear that actual construction is simple. For the amateur as well as the professional. These books were compiled to save you money and to permit you to have something which everyone wants to have—a hand made lamp.

Tells How to Make

Drop-lights—Reading Lamps—Square Dining Room Dome—Mission Chandelier—Desk-Light—Chandelier—Hexagonal Library Lamp—Hexagonal Dome—Etched Shade Lamps—Sawn Shades—conventional patterns, butterfly designs and pyramid designs. All you need is a few tools and the necessary materials. The book tells you how to make the lamps and shades. No one can afford to let this opportunity slip by. Send for these books today.

Price Prepaid 50c Each

Send us 50 cents and get either book without delay. Or, better yet, send us a dollar for both. They will be shipped prepaid to any address upon receipt of purchase price. Send for them now and begin working on your lamp immediately.

Popular Mechanics Book Department
6 N. Michigan Ave. CHICAGO

Please Mention Popular Mechanics

Trade Mark Reg.

WURLITZER

200 Years of Musical Instrument Making

Complete *Musical* Outfits

of ALL Musical Instruments

Seal grain covered, velvet and plush lined, carrying case, of the newest model. All attachments and extra parts for the instrument. Telescoping music rack. Instruction book will teach you to play even if you have no previous knowledge of music.

A NEW plan by Wurlitzer, the largest general music house in the World. *You get the complete outfit at factory prices at a tremendous saving to you.* Each instrument is musically perfect and has Wurlitzer's absolute guarantee.

On Free Trial

Any Wurlitzer Complete Musical Outfit will be shipped to you complete for a week's free trial. Play it a week as if it were your own. Compare it with other instruments. Then if you wish you may return the outfit at our expense. The trial costs you nothing.

These Complete Musical Outfits Are Ready:

Violin	Banjo	Hawaiian-Guitar	Fife	Cello
Cornet	Mellophone	Ukulele	Bugle	
Guitar	Trap Drum	Banjo-Mandolin	Flute	
Saxaphone	Clarinet	Tenor Banjo	Banjo-Ukulele	
Trombone	Mandolin	Piccolo	Banjo-Guitar	

Convenient Monthly Payments You may pay the low manufacturer's price for Wurlitzer Complete Outfits in small monthly sums. Payments as low as a few cents a day.

Illustrated Catalog FREE!

Each Wurlitzer Complete Musical Outfit illustrated in full color and described in detail. See for yourself, completely illustrated, everything that comes with each outfit. Send for the catalog now. Sent free and without obligation. State which musical instrument you are especially interested in. Clip off this coupon and mail it today.

The Rudolph Wurlitzer Company, Dept. A 119
117 East 4th St., Cincinnati, O. 329 South Wabash Ave., Chicago, Ill.

The Rudolph Wurlitzer Co., Dept. A 119
117 E. 4th St., Cincinnati—329 S. Wabash Ave., Chicago

Send me your new catalog with illustrations in color and full description of the Wurlitzer Complete Outfits and details of the free trial and easy payment offer.

Name .....

Address .....

.....

(Musical Instrument I am specially interested in)

Firestone

Motorcycle Tires

Built the Automobile Way

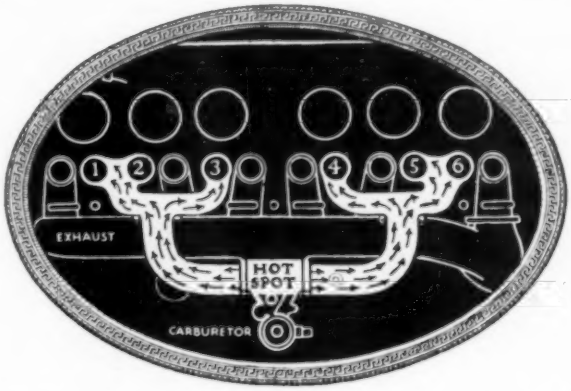
WITH Firestone Tires on your machine you get the benefit of that same tire building which, as everybody knows, gives most miles per dollar on any wheel, anywhere

Firestones have stamina; more than you'll ever need. And their resilience absorbs the rough spots instead of making your machine jump them.

Equip now—and note the quick response, the safe hold, fuel saving and long mileage.

Firestone Tire & Rubber Company
Firestone Park
Akron, Ohio
Branches and Dealers Everywhere

Please Mention Popular Mechanics



Bringing Your Automobile Up-to-Date

SUPPOSE that your stove is intended to burn a shovel-full of pea coal an hour and then suppose that you suddenly filled it with lumps as big as your hand. What kind of a fire would you have?

Most automobile engines are like that stove. *They are intended to burn a certain kind of fuel, but only the wrong kind is available.*

What happens in a running engine? First a liquid fuel is vaporized by spraying it; then the spray is mixed with air to form an explosive; next that explosive is compressed in the engine; finally the charge is fired. All this takes place in the fraction of a second.

The fuels of today do not vaporize readily. They cannot be sprayed finely enough. *You want a kind of gasoline fog. Instead you get rain.* The gasoline accumulates in little pools. It finds its way into the cylinder and eventually into the crankcase and the lubricating oil. *Think of it—gasoline in lubricating oil!* No wonder that the engine knocks and that you have big repair bills to pay.

Now you see why automobile engines of today are like the stove that is intended to burn pea coal and is trying to burn big lumps. Why it is so hard to start and to get underway, particularly on a cool morning. Why you are not getting all the power that the engine is supposed to deliver.

The Chalmers engineers have been working at this problem for two years. *They decided that automobile engines of today were behind the gasoline times.* It was impossible to buy the right kind of gasoline cheaply enough. There was only one solution: Improve the engine so that all the gasoline will be consumed—so that not a raw drop of it will be fed to the engine.

Heat will vaporize these modern heavy fuels. That is why you must wait for your engine to "warm up." But the ordinary process is too slow, too wasteful. Besides it doesn't prevent drops of unconsumed gasoline from forming.

The Chalmers engineers make the exhaust heat of the engine vaporize any drop of gasoline that touches the walls of the manifold, before it ever has a chance to reach the engine. *Their's is the Hot Spot engine.*

But that is not all. The manifold—the passage that supplies the charge to the engine—is too angular in many multi-cylinder cars. The vapor is not fed uniformly to all cylinders. It strikes corners.

The Chalmers engineers gave us the Ram's-horn manifold. It has easy bends—no sharp turns. Hence the cylinders are all supplied with the same quantity of vapor.

The Hot-Spot Insures:

Quick starting.

Perfect operation in 30 seconds on the coldest day.

No raw gasoline in the crankcase to "cut" the lubricating oil.

A cool engine on a hot day.

The Ram's-horn Insures:

A smooth running engine.

All cylinders working all the time.

Reduced vibration and therefore lower upkeep cost.

CHALMERS MOTOR CO. Detroit, Mich. U.S.A.

Quality First

This is the second of a series of six bulletins in which the wonderful features of the new Chalmers will be explained.

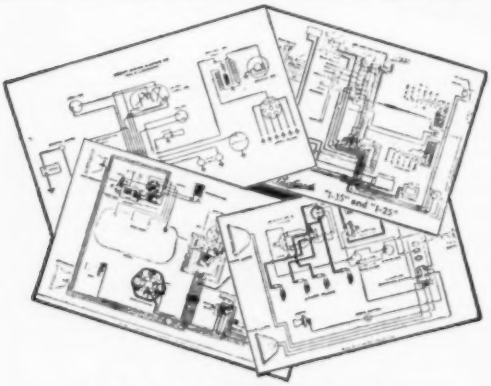
850 Wiring Diagrams

in the new edition of

Auto Electrician's Guide

Contains wiring diagrams for every car on the market including the new 1919 Starting and Lighting Systems for Ford cars, also diagrams for Baker R & L and Detroit Electric and pipe connections for Stanley Steamers. Covers all kinds of systems from 1912 to 1919 and many as far back as 1906.

Highly Endorsed by Auto Manufacturers, Garages, Service Stations and Auto Experts Everywhere



Actual Size of Diagrams, 5x7 Inches

No problem too puzzling if you have the Auto Electrician's Guide.

Any "Old Sticker" Quickly Solved

with the help of this book. Saves hours of time on both old and new jobs. Impossible for even experts to know **all** cars but **no car** will "stick" you when you have this book. A practical, easily understood "guide" that will simplify all auto-electric problems and make it possible for you to quickly overcome hundreds of starting, lighting and ignition troubles which otherwise would take hours to solve. Extensively used all over the country. Hundreds of auto experts and repair men depend on it to solve hardest problems. Dozens of letters received telling of its exceptional value.

A Loose Leaf Book

Easy to handle and easy to add new diagrams as issued. Convenient to slip into the coat or car pocket and invaluable as a constant companion for repairmen. Scores of trouble cases quickly and easily corrected with the help of this guide. Send Today.

Price $7.50 Postpaid

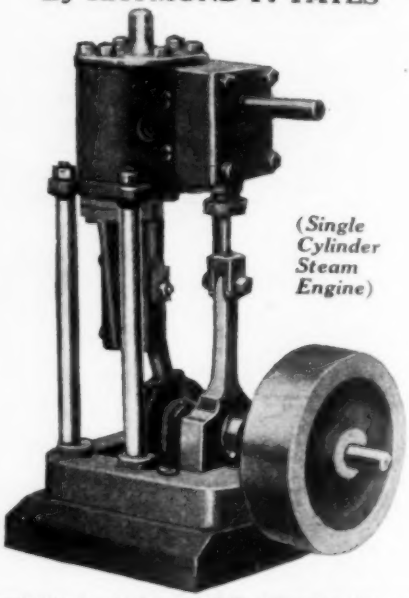
Money refunded if not satisfactory

POPULAR MECHANICS BOOK DEPT.
6 N. Michigan Ave. CHICAGO, ILL.

MODEL MAKING

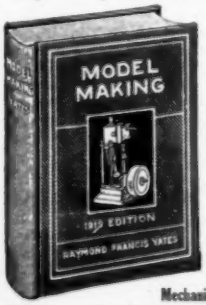
Including Workshop Practice, Design and Construction of Models

By RAYMOND F. YATES



(Single Cylinder Steam Engine)

THIS book does NOT describe the construction of toys. Its pages are devoted to model engineering and the mechanical sciences associated with it. It contains descriptions with illustrations of the complete models made by some of the leading model engineers in this country. It is the only book published on this important subject.



The book describes the construction of working models of various kinds, having 31 chapters devoted to model steam engines, boats, gasolene engines, guns, boilers, boiler fittings, locomotives, cranes, etc. Eight long chapters are included on the mechanical processes associated with model making, such as soft and hard soldering, pattern making, grinding, electroplating, etc. The first chapter gives many valuable hints concerning the model engineer's workshop and its equipment.

A Book for the Amateur and Professional Mechanic. Practical, Complete, Easily Understood.

Contents: The Model Engineers' Workshop—Lathes and Lathe Work—Drills and Drilling—Soft and Hard Soldering—Hardening and Tempering Steel—The Use of Abrasives—Pattern Making—Electro-plating—A Model Slide Crank Steam Engine—A Single Cylinder Engine—A Model Twin-Cylinder Marine Engine—Flash Steam Plants—A Flash Steam Plant for Large Model Airplanes—A Flash Steam Plant for Small Model Airplanes—A Model Steam Turbine—Design and Construction of Model Boilers—Model Boiler Fittings—A Record-Breaking Model Hydroplane—A Model Lake Freighter—A Sharpie-Type Model Boat—A Model Submarine Chaser—A Model Submarine with Radio Control—A Model Crane—An Electric Double-Drum Hoist—A Model Gasoline Engine—A Model Electric Locomotive—A Model Steam Locomotive—A Model Gyroscope Railroad—A Model Caterpillar Tank—A Model Siege Gun.

Cloth Binding, 400 Pages 303 Illustrations **Price $3.00 Postpaid**

FOR SALE BY

POPULAR MECHANICS BOOK DEPT., 6 N. Michigan Ave., Chicago

THE EXPO

WATCH CAMERA

The most wonderful and ingenious Camera made

It is but little larger than a watch, which it closely resembles. You can carry the **Expo** about in your pocket and take pictures without any one being the wiser.

One Cent a Picture

The Expo loads in daylight with 25 Exposure Films, costing 25c, thus the picture taking part of a whole day's outing may be had for the nominal sum of 25c—One cent a picture. 10 Exposure Films also obtainable. It is simplicity itself to operate. Takes pictures through the stem, where the **Rapid Fire Lens** is located. The photos (5/8 x 7/8) may be enlarged to any size.

Price $2.65

QUICK AS A FLASH Time and instantaneous shutters; weighs but 3 ounces; nickel plated. Endorsed by amateurs and professionals the world over. Thoroughly practical—printing and developing of films just the same as ordinary cameras—in daily use by the police, newspaper reporters, detectives, and the general public. Important seats have been secured with the Watch Camera by enterprising reporters. Produces clear, sharp negatives indoors or outdoors equal to any camera on the market, size or price notwithstanding.

Expo Watch Camera Postage 10c Anywhere **$2.65** FILMS, 10 Exposures 15c, 25 Exposures, 25c Leather Pocket Carrying Case, 35c

JOHNSON SMITH & CO., Dept. PM7, 3224 North Halsted Street, CHICAGO

THIS PRETTY RUBBER STAMP

WITH PAD AND INK, 75c

Here is the prettiest rubber stamp you ever saw. We have had this design specially engraved for our customers, and it cannot be obtained except through us. The design is ornamental, with floral decorations with a beautiful dove in the upper part conveying its message of love, the desired name or name and address being tastefully displayed in the center. With this rubber stamp you can brand your letter paper, envelopes, postals and other stationery, and the elaborate and unique design will be admired by all. Placed upon the outside of envelopes, packages and other mail matter, it ensures their return to the sender in the event of non-delivery for any reason. It looks very pretty stamped on books, music, photographs, etc. With each stamp we include a self-inking stamp pad and a bottle of ink for re-inking the pad, and the PRICE of the COMPLETE OUTFIT is ONLY **75 CENTS**, POSTPAID. **J. S. & CO., Dept. PM7, 3224 N. Halsted St., Chicago**

MIDGET BIBLE

The Smallest Bible in the World

The Midget Bible is a perfect gem, and a work of art. It is about the size of a postage stamp and contains TWO HUNDRED PAGES of the NEW TESTAMENT. This little Bible is a wonder. It is said to bring good luck to the owner. Must be seen to be appreciated. **Price, only 12 cents, three Bibles for 30 cents; one dozen Bibles for $1.00 or 100 for $6.00.** Good money can be made selling these Midget Bibles amongst friends, church acquaintances, Sunday schools, bazaars, etc. Send for a few and try it.

JOHNSON SMITH & CO., Dept. PM7, 3224 North Halsted Street, CHICAGO

LUMINOUS PAINT

Make Your Watches, Clocks, Etc., Visible by Night The very latest discovery in the scientific world. Hitherto, practically unobtainable except at an exorbitant price, we have at last succeeded in producing this remarkable LUMINOUS PAINT, which, applied to the surface of any article, **emits rays of white light**, rendering it **perfectly visible** in the dark. **THE DARKER THE NIGHT, THE MORE BRILLIANT IT SHINES.** Quite simple to use. Anyone—you can do it. A little applied to the dial of your watch or clock will enable you to tell the time by night. You can coat the push buttons or switch plates of your electric lights, match boxes, and innumerable other articles; make your own Luminous Crucifixes, Luminous Rosaries, etc. Bottle containing sufficient to coat several small articles. **Price 25c. Larger sizes 50c and $1 postpaid. J. S. & Co., Dept. PM7, 3224 N. Halsted St., Chicago**

WONDERFUL X-RAY TUBE

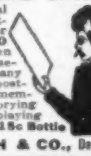
A wonderful little instrument producing optical illusions both surprising and startling. With it you can see what is apparently the bones of your fingers, the lead in a lead pencil, the interior opening in a pipe stem, and many other similar illusions. A mystery that no one has been able to satisfactorily explain. Price **10** cents; **3** for **25** cents; **1** dozen, **75** cents.

JOHNSON SMITH & CO.

STAGE MONEY

With a bunch of these bills, it is easy for each person of limited means to appear prosperous. By flashing a roll of these bills at the proper time and peeling off a genuine bill or two from the outside of the roll, the effect created will be found to be all that can be desired. **Prices, postpaid: 15 Bills 10c, 50 Bills 25c, 125 for 50c, or $3.50 thousand.**

INVISIBLE INK

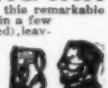


The most confidential messages can be written with this Ink, for the writing **MAKES NO MARK.** Cannot be seen unless you know the secret. Invaluable for many reasons. Keep your postals and other private memorandums away from prying eyes. Great fun for playing practical jokes. **Only 15c Bottle**

VANISHING INK

Writing written with this remarkable ink vanishes entirely in a few weeks (sooner if desired), leaving the paper QUITE BLANK. **15c ppd.**

LUMINOUS INK



writing can be READ ONLY IN A DARK ROOM; writing **shines like fire.** Quite invisible at daytime. Very remarkable. **15c**

JOHNSON SMITH & CO., Dept. PM7, 3224 North Halsted Street, CHICAGO

NEW BOOK ON ROPE SPLICING

USEFUL KNOTS, HITCHES, SPLICES, ETC.

PRICE 20c

How Different Knots Are Made and What They Are Used For. Knots to Use and Knots to Avoid.

A most practical handbook giving complete and simple direction for making all the most useful knots, hitches, rigging, splices, etc. Over 100 illustrations. All about wire rope attachments, lashing, blocks, tackles, etc. 37 Heraldic Knots illustrated. Of great value to mechanics, riggers, campers, boatmen. Price 20c p. pd.

J. S. & Co., Dept. PM7, 3224 N. Halsted St., Chicago

New Vamping Card

No Teacher Needed
Surprisingly Simple System

Persons having neglected their Musical Education need not despair, for with the aid of our new VAMPING CARD (placing the card upright over the piano keys), you can at once Vamp away to thousands of Songs, Ballads, Waltzes, Rag Time, etc., etc., equal to a Professional Musician. No knowledge of music is required. After using it a few times, you will be able to dispense with the aid of the Vamping Card entirely. **Only 15 cts. p. pd. J. S. & Co., Dept. PM7, 3224 N. Halsted St., Chicago**

MUSICAL KAZOO

With the **Musical Kazoo** you can, without previous practice whatsoever, play any tune right off, imitate any bird or animal, bagpipe, snare drum, Punch and Judy, etc. No holes to finger. It is simplicity itself. Produces excellent music. You do not blow into it, but sing, speak, laugh or make any desired imitation. Used with astonishing results at society meetings, home, club or church entertainments, dances, serenades, picnics, outings, excursions. Just the thing for choruses and shows, bicycle and marching clubs, etc. Excellent for vocal or instrumental accompaniments, either with or without other musical instruments. **Price 15c p. pd.**

Mystic Skeleton

10c ppd.

A jointed figure of a skeleton 14in. in height, will dance to music and perform various gyrations and movements while the operator may be some distance from it.

Serpent's Eggs

Box contains 12 eggs. When lit with a match, each one gradually hatches itself into a snake several feet long, which curls and twists about in a most lifelike manner. **Price per box, 10c ppd.**

JOHNSON SMITH & CO., Dept. PM7, 3224 North Halsted Street, CHICAGO

Trim Your Own Hair With the Utility Safety Hair Cutter

Cuts the Hair Any Length, Short or Long—Saves Its Cost First Time Used.

Only 35c Postpd. Extra Blades 5c Each

If you can COMB your hair you can TRIM your own hair with this marvelous invention. The UTILITY TRIMMER will cut hair any length you desire, short or long, finish the job as nicely as any barber and in one-fourth the time before your own mirror. The ladies can cut the children's hair at home in a jiffy; can be used as an ordinary razor to shave the face or finish around the temples and neck. Sharpened like any razor; can be carried in the vest pocket ready for instant use and will last a lifetime.

To use it, stand in front of a mirror, if necessary, and use the UTILITY TRIMMER like you would a comb. Push it through the hair, downward, in the direction the hair lies, **but Never Upward.**

To cut long hair, first moisten the hair and comb it, so it will lie close to the head, then start cutting with downward cuts as high as you desire, evenly all around the head. **Finish** around the neck and temples with a square cut, like a barber.

It is impossible to leave any "nicks" or "cat steps" in your hair with this device, as the handle guard guides the cutter blade evenly over the scalp.

To cut very close, push the blade until the cutting edge is even with the guard teeth.

To shave the face or neck it can be used as an ordinary razor by reversing the blade in the holder, the cutting edge being to the back of the holder, exposing the entire blade, except each corner.

To hone, place the blade in the holder, with the cutting edge to the back, moving the blade out until the cutting edge is clear of the back of the holder. Then hone in the usual manner; finish on a strop as with an ordinary razor.

JOHNSON SMITH & CO., Dept. PM7, 3224 N. Halsted St., Chicago

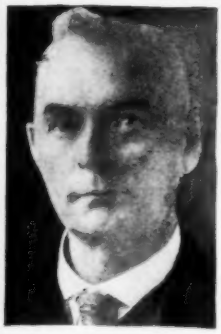
All the Latest Surprising and Joke Novelties

Pharo's Serpents Eggs, box	10c	Mesmerized Penny (defies the law of gravitation)	20c
Miniature Water Pistol	10c	Mysterious Tumbler and Vanishing Coin Trick	25c
Cleopatra's Snake (very lifelike)	15c	Magic Mirror (take one peep)	10c
False Mustache (f cool your friends)	5c	Magic Plate Lifter	20c
Automobile Puzzle (Latest)	20c	Imitation Gold Teeth	3 for 10c
Mysterious Ghost, shines at night	10c	Great Burglar Puzzle	10c
Great Palming Coin Trick	25c	Wire Puzzles, 10c. 22 different	$1.95
Rubber Dagger (sensational)	20c	"Elec-Trick" Push Button	10c
Window Smashers (great joke)	25c	Inkless Pen (writes with water)	10c
Lookbackroscope (see behind you)	15c	Imitation Bed Bugs	10c
Great Mind Reading Mystery Cds.	10c	Squirt Ring	20c
Thurston's Mysterious Trick Cds.	10c	Trick Bill Book	10c
Liars License	10c	Acquaintance Cards (witty and amusing)	10c
Cover the Spot Trick, a scien. nov.	10c	Glass Watch, 10c. 22 different	25c
X Ray Novelty	10c	Multiplying Billiard Ball Trick	25c
Trick Pencil	10c		
Rubber Tacks (a good joke)	10c		

JOHNSON SMITH & CO., Dept. PM7, 3224 North Halsted Street, CHICAGO

Save

TIRES LIKE THESE



I Earned $2200 IN Four Months

This is Richard A. Oldham

Mr. Oldham was telegraph operator for the Illinois Central Railroad for twenty years. He is fifty-eight years old. One day he read one of my advertisements and the possibilities of making money in the Auto Tire Surgery Business. In a few weeks he had purchased and installed a Haywood outfit. A short time afterward he wrote us that his income in four months was as much as it had been in Two and One-Half years as Telegraph Operator.

Earns $800 Month

This is E. T. Buchmann

He is a Tire Surgeon at 4903 N. Clark St., Chicago. He says: "Am earning $800.00 per month, and confining myself solely to re-building of Tires by Haywood Method."

Be a TIRE SURGEON

Make $2,500 to $4,000 Per Year Giving New Life to Old Tires.

It is being done—by the wonderful new Haywood Method of Tire Surgery. It is one of the great results of the war. A Haywood Tire Surgeon can do more with old tires than was even dreamed of before the war. By the **Haywood Method a Haywood Tire Surgeon** can give 4,000 to 5,000 more miles of new life to a tire, that two years ago would have been thrown on the junk pile. As a surgeon saves human lives by his operations, so by **Haywood Tire Surgery,** you can save and lengthen the life of old tires. And it's easy to learn.

HAYWOOD'S TIRE SURGERY

Stations Are Needed Everywhere

20,000,000 tires wearing down every day. By Tire Surgery, you can quickly repair, rebuild and give new life to tires seemingly all worn out. Cuts, gashes, tears, bruises, broken fabric, every kind of an accident that can happen to **any** tire, inside or out, you can repair and save for long service. **The chance to make money is simply wonderful.**

WITH THIS HAYWOOD OUTFIT

$2,500 to $4,000 A YEAR Is Possible

During the war the nation needed an unusual service to keep the thousands of automobiles, ambulances and aeroplanes going day and night. **HAYWOOD TIRE SURGERY** met the demand.

If we told you all the truth you wouldn't believe it. You would say, "It is too good to be true". But you can see what a great field there is for **Haywood Tire Surgery Stations**—for this better way. You have eyes. You see why there **must** be wonderful chances to make money. But to see—to know—is **not enough. It is action—decision** that counts these days. The man who waits, gets lost in the shuffle. **It is the resolute will to follow your hunch that lands** you where the money is.

WRITE TODAY

M. HAYWOOD, President
Haywood Tire & Equipment Co.
973 Capitol Ave., Indianapolis, Ind.

DEAR SIR: Please send me by return mail your free book on the new Haywood Tire Surgery Method and the details of your free school of tire repairing.

Name.....

Address.....

.....

Send Today For My Free Book

I have ready to mail you the day I get your request, a fascinating book—all about tires—how to repair them by the Haywood Method—how to start in business—how to build up trade—what to charge. You needn't write a letter—just tear out the coupon right now, fill it in and mail. In 48 to 72 hours you can have the whole proposition right in front of you. It's a case of walking right into $2500 to $4000 a year and up. Use coupon at the left.

M. HAYWOOD, Pres.
Haywood Tire & Equipment Co.
973 Capitol Avenue Indianapolis, Indiana

Please Mention Popular Mechanics

The SHAW MOTORBICYCLE

A Superior, Easy-Running, Dependable Power Bike at Low Cost

There is no need to pay a high price for a dependable motorcycle now. There is no need for you to be without a power machine that will take you over the hills. Here's your opportunity to save from one-third to one-half and own a Motorbicycle that will surprise you with its power, low up-keep and ever-ready service.

The SHAW MOTORBICYCLE is the most economical way of motoring. It is a strong, specially designed bicycle, made of heavy gauge tubing, fitted with strong wheels and large, rugged tires. Equipped with a 2½ h.p. motor. Has chain drive with free engine clutch. It is lighter, more attractive, easier to handle and less expensive to operate than a motorcycle, as shown by the following facts:

90 to 125 miles per gallon of gasoline
1200 to 1800 miles per gallon of cylinder oil
8000 to 12,000 miles per set of tires

Special motor, built in our own factory, under rigid inspection. Very compact. All parts easy to get at. High tension magneto. Famous breeze carburetor. Automatic lubrication. Entire control extremely simple and efficient.

We also manufacture the Shaw Attachable Motor Outfit which converts a common bicycle (with single or double bar) into a reliable motorcycle. The Shaw is so designed that it can be quickly attached to any bicycle without the aid of mechanic or special tools. Thousands in use in U. S. and foreign countries.

Write At Once *For Full Particulars* ***Free!***

Shaw Manufacturing Co.
Dept. 303
GALESBURG, KANSAS

SHAW MANUFACTURING CO.
Dept. 303, Galesburg, Kansas

Send me full information about the Shaw Motorbicycle and Shaw Attachment, without obligation on my part.

Name.....

Address.....

Bernard-Hewitt & Co., Desk H-26
424-434 So. Green St., Chicago, Ill.

Please send me your new men's wear Spring and Summer style book with samples of latest woolens and full details of your plan.

Name .....

Address .....

.....

MAIL THIS COUPON

Save Money on Everything You Wear

Samples FREE

This $27.50 Suit $17.50

TAILORED TO YOUR MEASURE

An Amazing Offer! A high-grade suit cut to your individual measure—tailored with all the skill and style that only the best custom tailors can give. Finished with highest grade trimmings and linings—the kind that wear and give satisfaction. A special proposition to introduce to the readers of this magazine the wonderful values offered by our system of tailoring. Nothing else like it—no value to equal it.

We pay shipping charges

How Our Plan Saves You Money

We have no agents, no dealers, no traveling salesmen. Our catalog is our only representative. Actual comparison will show that our plan saves $10 or more on every suit and gives you real individuality in your dress—clothes that are tailored to fit you and you alone—reflect your personal tastes. Our line includes a wonderful selection of fancy wool worsteds, cassimeres and all-wool **blue serges, at unheard-of low prices.**

Send Only $3.00

and your measurements, with cloth selection made from our catalog. We will make the suit to your measurements and you pay balance on arrival—we paying all transportation charges. So confident are we that we can please you that all we ask is that you make a trial of our system; that you learn how easy it is to take your own measure and save money on every suit. We take all the risk, you none, for this is our

GUARANTEE: Complete satisfaction or all money refunded.

You must be pleased in every particular—in fit—in style—in workmanship and materials, or we don't want your money. Could anything be fairer? Write today—wear tailor-made clothes of exceptional style and value—dress better and save money.

$17.50

Catalog Free

Our big, new Spring and Summer book is ready for you—contains samples latest woolens—also lowest prices on men's hats, shoes and furnishings. It is your guide to correct and economical clothes buying. Mail coupon above or write, mentioning this publication so we can identify this special offer.

From the Catalog
COLLARS
Six for 75c
Four ply, hand laundered stiff or soft collars, 21 different styles to select from, selling everywhere now at 25c each. We sell them at **6 for 75c.**
In ordering be sure to state size number and style desired.

From the Catalog
NECKTIES
Large Four-in-hands, 3 for $1.00
Large imperial shape, flare end four-in-hand ties, beautiful striped and flowered effects, hundreds of patterns, regular 50c and 75c values **Three for $1.00**
Try Three. State color desired.

From the Catalog
SHIRTS
Satin Stripe Shirts 3 for $4.50
Guaranteed $2.00 shirts, latest effects in broad satin or silk stripes, coat, soft turn-back cuffs, hand-laundered body. Try three at our low price, 3 for $4.50. State size of neckband when ordering. Choice of black, blue and lavender stripes.

From the Catalog
GARTERS
Men's pad garters, best known standard make, made so no metal can touch you.
25c single grip pad 19c
50c single grip pad 39c
25c double grip pad 21c
50c double grip pad 43c
All colors to select from.

BERNARD-HEWITT & CO

424-434 S. Green St., Desk H-26 Chicago, Ill.

Please Mention Popular Mechanics

I Will Save You MONEY

Read My Special Offer

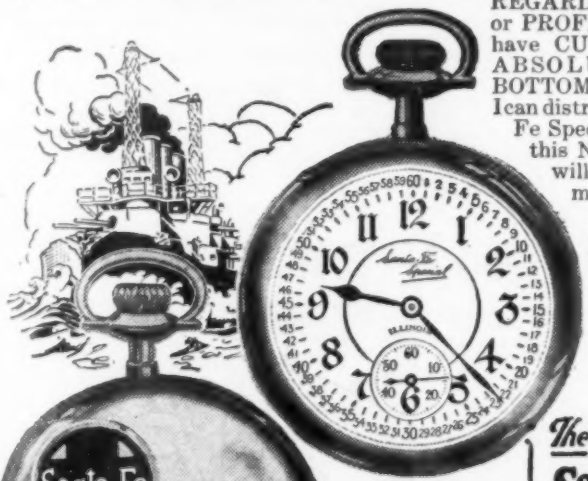
President
Alonzo S. Thomas,
Santa Fe Watch Co.

To Readers of Popular Mechanics:

My sole aim, during the year 1919, shall be to place as many standard, dependable Watches as I can in the hands of men throughout the land, REGARDLESS of PRICE or PROFIT. To do this I have CUT the PRICE to ABSOLUTELY ROCK BOTTOM. I know that if I can distribute 5,000 "Santa Fe Specials" this year on this NO-PROFIT PLAN, that every Watch will be a salesman and sell at least one more. I am making this STARTLING AND UNHEARD OF OFFER to those who will tell their friends of this remarkable Watch value, if they find the Watches all and more than I claim for them.

Signed, Alonzo S. Thomas

Pres. Santa Fe Watch Co.



Buy Your Watch NOW!

21 Perfect Jewels
Adjusted to Positions
Adjusted to Isochronism
Adjusted to Temperature
3-Color Inlay Cases
New Designs

BIG WATCH VALUE

The ILLINOIS Famous $ Santa Fe Special 21 JEWEL RAILROAD WATCH 2.50 A MONTH

The Standard Railroad watch that is GUARANTEED FOR LIFE. These watches are NOW in the service on practically every Railroad in the United States. "Santa Fe Special" watches are in every branch of the Army and Naval Service. Thousands of them are distributed all over the world. They are **GUARANTEED ABSOLUTELY, TO GIVE SATISFACTION IN EVERY WAY OR MONEY BACK.**

The wise man will act quickly if he wants a watch. Write today for the FREE watch book and make your selection quickly, before this offer is withdrawn.

Save $\frac{1}{3}$ to $\frac{1}{2}$ of Your Money

Most Liberal Offer Ever Made

Our "Direct-to-You" low wholesale terms and EXTRA SPECIAL DISTRIBUTION PLAN is fully explained in the NEW Santa Fe Special booklet just off the press. The "Santa Fe Special Plan" means a BIG SAVING of money to you and you get the BEST watch value on the market today. WATCH SENT FOR YOU TO SEE WITHOUT ONE PENNY DOWN.

New Case Designs

The new watch book shows all the very latest designs of the world's most talented engravers, each case illustrated in beautiful color combinations, showing three-color INLAY MONOGRAMS, ENGRAVED MONOGRAMS, fraternity emblems, French art and special designs.

Right NOW as other manufacturers are advancing prices on watches we are slashing **OUR PRICES** to **absolute rock-bottom.** WE ARE FORCING WATCH PRICES DOWN. We can do this simply by sacrificing profits.

A postal, letter or the coupon brings the new watch book.

Santa Fe Watch Company

66 Thomas Bldg., TOPEKA, KANSAS

Home of the Great Santa Fe Railway

A letter, a postal or this coupon will bring this Free Watch Book

SANTA FE WATCH CO., 66 Thomas Bldg., Topeka, Kansas

Please send me the New Watch Book with the understanding that this request does not obligate me in any way.

Name .....

Address ..... State .....

Drawing Table and Drawing Outfit

I'LL give you this handsome set of drawing instruments in a plush lined folding case—a 20x25-inch drawing board, a 24-inch T square, a 12-inch rule, a supply of drawing paper, two triangles, a French curve, pencils, erasures, thumb tacks and the "Chief's Own" adjustable, folding drawing table. Yes, I give it to you absolutely free. It's an outfit that you couldn't duplicate for less than $20 or $25. Just the kind of an outfit used by the higher paid draftsmen. And I give it to you free the day you start getting the training for that $200 job.

FREE

I'll Train You for a $200 Job

Be a draftsman. There is an urgent demand for skilled draftsmen. Companies are issuing calls every day for men to fill positions that pay from $175 to $200 a month. I am chief draftsman of a large and well known firm. I have been doing the highest paid drafting work for a quarter of a century. I know just the things that you must know in order to hold a responsible, high paid position. **And I will train you during your spare time.** You will receive my personal attention from the day you start until the time you are qualified to fill a high paid position. Go just as fast or just as slowly as you please. My offer to you is to train you **until you can hold a big, straight salary—$200 a month position.**

I'll Help You Get a Job

Furthermore, after you have completed the training I'll do my best to start you to work as a high-class, high salaried draftsman. I know what the big companies are demanding. I know chief draftsmen in other big companies all over America, and they all know that the men I have trained are qualified to do any kind of draftsmen's work, and I'll write to them personally, if necessary, to help you get a job. Draftsmen are needed in all parts of the country and probably you will be working as a high salaried draftsman long before I am all through with your training.

Send Me the Coupon Now

If you'll send me the coupon today I'll send you a book that has meant dollars to hundreds of men. I call it "Successful Draftsmanship." It tells about the drafting profession and the opportunities that exist today. It contains concrete facts and figures from cover to cover. It tells about the need for men and shows samples of actual work done and explains the value of practical training and practical experience. You will be under no obligation in sending for this book. Merely put your name and address on the coupon and send it now.

Chief Draftsman Dobe
Engineer's Equipment Company, Inc.
Division A919 CHICAGO, ILL.

Chief Draftsman Dobe
Engineer's Equipment Company, Inc.
Div. A919, Chicago, Ill.

Without any obligation on me whatsoever, please mail your book, "Successful Draftsmanship," and full particulars of your liberal "Personal Instruction" offer to a few students. It is understood that I am obligated in no way whatever.

Name.....

Address.....

.....

Please Mention Popular Mechanics

Electricity Wins!

Jobs Requiring No Special Training Pay from $12 to $25 a Week and Offer No Future

L. L. COOKE,
CHIEF ENGINEER
CHICAGO ENGINEERING WORKS

The Expert Electrician Earns from $46 to $100 a Week and is Always in Line for the Big Jobs

ELECTRICITY-L·L·COOKE-SUCCESS
I TEACH ELECTRICITY. LET ME MAKE YOU A SUCCESS

Be a Certificated Electrician!

Electricity is to-day lighting and moving the world. It is calling for experts in this business and offers you a bigger success than any other profession. Go after some real money. Qualify for one of the thousands of splendid positions open. All you need to start is a few months' snappy, **practical** instruction from a competent Engineer. Come with me—**NOW.** I'll give you my personal care to ensure rapid and efficient progress. My course is intensely practical. It is highly condensed, simplified, up-to-date and complete.

SATISFACTION GUARANTEED

I am so sure you will make a splendid success in this study, that I will **Guarantee Under Bond** to return to you every cent paid for tuition, if you are not entirely satisfied when you receive your Electrician's Certificate granted you as a graduate of my school.

Prepare yourself for a real position, by my **Home Study Course** in **Practical** Electricity. I am Chief Engineer of the Chicago Engineering Works. I have trained thousands of men and can help you better than anybody else. We also have large, splendidly equipped shops where you can come at any time for special instruction without charge. No other correspondence school can give you this.

FREE—LESSONS AND OUTFIT

Send me the Free Outfit Coupon at once. Do it **now!** For a limited period I am making a slashing cut in the cost of tuition, and giving each new student a grand outfit of Electrical Tools, Material and Instruments—in addition—**Absolutely Free.** I will also send you—free and fully prepaid—Proof Lessons to show you how easily you can be trained at home to enter this great profession, by means of my new, revised and original system of mail instruction.

WRITE NOW — DON'T DELAY

Delay never got you anything. Action is what counts. Get started—and get started now. Write for my big new book—"How to Become an Electrical Expert."

L. L. COOKE, *Chief Engineer*

CHICAGO ENGINEERING WORKS

Dept. 16 **441 Cass Street** **CHICAGO**

USE THIS "FREE OUTFIT" COUPON

Chief Engineer Cooke, Dept. 16, 441 Cass St., Chicago, Ill.

Sir: Send at once—fully prepaid and entirely free—complete particulars of your great offer for this month.

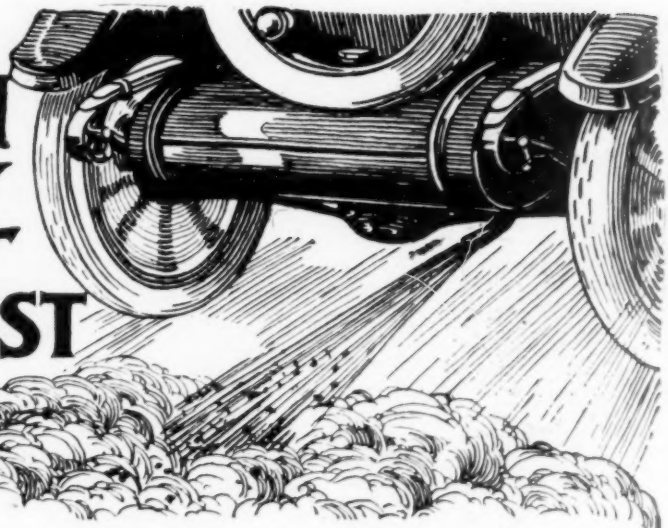
Name.....

Address.....

City.....

State.....

REMOVE CARBON THE EASY WAY = *OUT* THE EXHAUST



THE easiest, cleanest, safest and most satisfactory method of removing carbon deposits is with Johnson's Carbon Remover. It will save you from $3.00 to $5.00 over any other method without laying up your car and with much better results. After one application your car will run like it did the first 500 miles—quietly and full of "pep"—and you will secure the maximum power and speed from the minimum amount of fuel.

Johnson's Carbon Remover is a harmless liquid to be poured or squirted into the cylinders. It contains no acids and does not affect lubrication or interfere with the oil in the crank case. Millions of cans have been used. Recommended by many of the leading car Mfrs. including the Packard and Studebaker Companies.

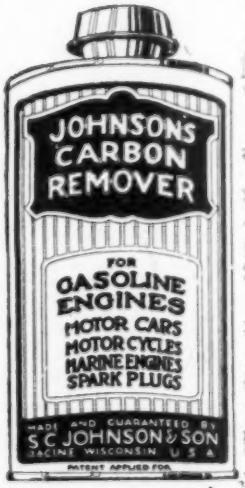
JOHNSON'S CARBON REMOVER

A dose of Johnson's Carbon Remover—the engine laxative—will cure 80% of engine troubles. It will increase the power of your car—improve acceleration—stop that knock—quiet your motor—save your batteries—cut down your repair bills—and reduce your gas and oil consumption.

Don't wait until your motor is choked with carbon—remove it every week or two with Johnson's Carbon Remover. You can do it yourself in five minutes—no mechanical experience necessary.

The regular use of Johnson's Guaranteed Carbon Remover will automatically eliminate most valve trouble and keep your motor clean, sweet and at its highest efficiency.

For sale by Hardware, Accessory dealers and Garages. Send for our booklet on Keeping Cars Young—it's free.



S. C. JOHNSON & SON, Dept. PM6 Racine, Wis.
Established 1882

A New $100 Oliver

Latest Model—for Only

$57

We Ship It to You for Free Trial. You Can Decide After Trying It

We offer here our identical Model No. 9, formerly priced at $100. Not a single change has been made in its design or materials. Only our plan of selling has changed. New economies made possible through war time methods enable us to save you the $43 it used to cost us to sell you an Oliver. If any typewriter is worth $100 it is this splendid, speedy Oliver.

You may order direct by mailing the coupon below. We ship the Oliver to you for free trial. You can then judge it yourself. You can compare its workmanship. At no time during the trial are you under obligation to buy. You can keep it or return it. No eager salesman need influence you. The Oliver must convince through merit alone.

Only $3 Per Month Pays for It

If, after trial, you agree that the Oliver is the finest typewriter, regardless of price, and you want to own it, merely pay us $3 per month until the $57 is paid. This is like renting it, yet you own it before you realize it. If you want to return it, ship it back express collect. We even refund the outgoing transportation charges.

We are able to make this unlimited free trial offer because of the Oliver's ability to prove its own case. Everyone appreciates the saving and the easy payment plan.

Over 700,000 Olivers have been sold. There are satisfied users everywhere.

Mail the coupon now for your Free Trial Oliver or further information.

Canadian Price, $72

THE OLIVER TYPEWRITER COMPANY
1096 Oliver Typewriter Building
Chicago, Ill.

Save $43 This Easy Way

Mail Right Now

THE OLIVER TYPEWRITER COMPANY
1096 Oliver Typewriter Building, Chicago, Ill.

☐ Ship me a new Oliver Nine for five days free inspection. If I keep it, I will pay $57 at the rate of $3 per month. The title to remain in you until fully paid for.

My shipping point is.....
This does not place me under any obligation to buy. If I choose to return the Oliver, I will ship it back at your expense at the end of 5 days.

☐ Do not send a machine until I order it. Mail me your booklet—"The High Cost of Typewriters—The Reason and the Remedy," your de luxe catalog and further information.

Name.....

Street Address.....

City..... State.....

Occupation or Business.....

Get Your Copy of this Big Book

It's Free. Write to day for your copy It's Ready

You Can Now Buy Direct From Our Factory At Wholesale Prices

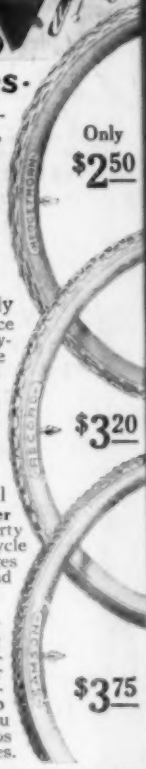
The **Big Ranger Book** accurately illustrates and describes the largest and most complete stock of bicycles, tires, sundries and repair parts in the world. A 12 year old boy can select and order his needs from this catalog without assistance, because the pictures and explanations are so clear and simple. You can join the great Mead army of **more than a million customers** (in all parts of the world) by using coupon—or a post card. Simply ask for a free copy of the Ranger Book, also our wholesale prices and terms.

DELIVERED TO YOU FREE

From the catalog you can select this handsome, completely equipped, electric-lighted "**Motorbike**" Model or your own choice from the **44 styles,** colors and sizes in the famous **Ranger** line of bicycles that are pictured *in actual colors* in this catalog. There are also many other models to select from—all at factory prices that will save you big money. There is a Mead Bicycle to suit the taste of every rider—*Roadsters, Racers, Juniors* for small boys —*Girls'* and *Ladies'* Models, too. All at money-saving prices possible only because of our **factory-direct-to-the-rider** selling plan. Prompt shipments and safe delivery guaranteed on every bicycle, also on all orders for parts and repairs.

30 DAYS FREE TRIAL We ship on approval and will send the **Ranger** bicycle you select to your town—we to pay charges—for thirty days use and trial to let you get acquainted with the bicycle fully before you decide to keep it. We pay the return charges if you decide not to keep it and make no charge for use and wear while you are trying it.

PARTS FOR ALL BICYCLES In the Ranger catalog you will find illustrated bicycle cranks, cups, cones, sprockets and a complete Universal Repair Hanger and Repair Front Forks designed to fit any and every bicycle ever manufactured in America. Complete instructions are given so that any boy can intelligently order the parts wanted. You will also find repair parts for all the standard makes of hubs and coaster brakes and all the latest equipment and novelties.



Rider Agents Wanted Select from our big catalog the **Ranger** model you prefer and while you ride and enjoy it, make big money by taking orders from friends and neighbors.

TIRES AT FACTORY PRICES Share with us our savings in Trainload Tire Contracts and in the **Samson, Record** and **Hedgethorn** Tires get the best Tire values in America at Wholesale Factory Prices.

SEND NO MONEY But write us TODAY for the **Big Ranger Book** and particulars of our 30 Day Trial plan.

MEAD CYCLE COMPANY
Dept. M108 CHICAGO

Send me (free) the new Ranger Bicycle Book and special *Factory-to-Rider wholesale prices,* full particulars of your *30 Day Free Trial* offer and terms. I am under no obligation to buy a bicycle or bicycle supplies because of this request.

Name _____

P. O. Box
R. F. D. or St. No. _____

Town _____ State _____

MEAD CYCLE COMPANY
Dept. M108 CHICAGO